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Consultant's Guide for Fire Detection & Alarm Systems for Buildings

contents

Section one
Specification for a Digital Addressable Fire System

1.	General Requirements	1
2.	Standards and Specifications	3
3.	Control and Indicating Equipment	5
3.1	General Requirements	5
3.2	System Configuration	7
3.3	Mechanical Design	9
3.4	Basic System Functions	9
3.5	Alarm Monitoring Functions	12
3.6	Alarm Output Functions	13
3.7	Supervision and Fault Reporting	14
3.8	System Management Facilities	15
3.9	Technical Specification	16
4.	Automatic Fire Detectors	17
4.1	General Requirements	17
4.2	Triple Sensing Detection	19
4.3	Optical Smoke Detectors	21
4.4	High Performance Optical Smoke Detectors	22
4.5	Infra-Red Flame Detectors	23
4.6	Infra Red Array Flame Detection	24
4.7	Heat Detectors	26
4.8	Linear Heat Detectors	27
4.9	Beam Smoke Detectors	28
4.10	Aspirating Smoke Detectors	29
4.11	Carbon Monoxide (CH) Fire Detector	30
4.12	Remote Indicator Module	31

contents

5.	Associated Ancillary Equipment	33
5.1	General Requirements	33
5.2	Addressable Manual Callpoints	33
5.3	Conventional Detector Interface Module (Including 4-20mAmonitoring)	34
5.4	Addressable Relay Output Module	35
5.5	Addressable Contact Monitoring Module	35
5.6	Addressable Sounder Notification Module	36
5.7	Loop Powered Addressable Sounder Notification Module	36
5.8	Sounder Booster Module	36
5.9	Auxiliary Power Supplies	37
5.10	Line Isolator	37
5.11	Door Control Module	37
5.12	Multiple Input/ Output Module	38
5.13	Quad Modules	39
5.14	Single Input/ Output Module	39
5.15	Loop Powered Beam Detector Module	40
5.16	Addressable Loop Powered Sounder/ Beacon	40
5.17	Addressable Loop Powered Sounder/ Beacon Base	41
5.18	Conventional Sounder/ Sounder Visual Devices	42
5.19	High Voltage Relay Module	42
6.	Cables	43
6.1	Type	43
7.	Networking and Graphics	44
7.1	Sub Panels	44
7.2	Graphical User Interface	44
8.	Documentation	48
8.1	Tender Documentation	48
8.2	Contract Documentation	48

contents

9.	Installation	50
9.1	General	50
9.2	Installation of Detectors	50
9.3	Installation of Control Devices	51
9.4	Installation of Fire Controller Equip-ment	52
10.		54
10.1	Commissioning	54
10.2	General	54
10.3	Testing and Start-up	55
10.4	Commissioning	56
10.5	Programming and Service Tool Handover	56
11.		57
11.1	Training	57
11.2	General	57
11.3	System Supervisor Training Other Staff Training	57
12.		58
12.1	Maintenance	58
12.2	General	58
12.3	System Spares System Test Equipment	59
	Appendix A	60
	Short Form Specification Key Points	60
	Control & Indicating Equipment	60
	Automatic Detectors	60
	Associated Ancillary Equipment	61
	Networking & Graphics	61
	Training	61

contents

Section Two:

Introduction	65
Control and Indicating equipment	75
Fire alarm devices - sounders	80
Power supply equipment	85
Heat detectors - point detectors	90
Smoke detectors	97
Flame detectors	102
Manual call points	106
Smoke detectors - line type	112
Compatibility assessment of system components	116
Voice alarm control and indicating equipment	119
Short circuit isolators	125
Input / output devices	129
Aspirating smoke detectors	132
Alarm transmission and fault warning routing equipment	138
Fire alarm devices - visual alarm devices	142

contents

Section Two:

Components of voice alarm systems - loudspeakers	148
Components using radio links	153
Electrical apparatus for potentially explosive atmospheres Intrinsic safety “I”	156
Fixed firefighting systems - components for gas extinguishing systems	162

Section one

Specification for a digital addressable fire system

general requirements

1 General Requirements

1.1 The Fire Alarm company shall be responsible for the design, supply, installation, commissioning and maintenance of a digital addressable fire detection and alarm system.

1.2 The Fire Alarm company shall be capable of providing a remote alarm monitoring service with a direct communications link to the Fire Service.

1.3 The Fire Alarm company shall have an adequate number of competent staff trained and experienced in the design, installation, commissioning and maintenance of digital addressable fire detection and alarm systems.

1.4 The Fire Alarm company should have a minimum of 10 years experience in designing, installing, commissioning and maintaining fire detection and alarm systems, at least 5 years of which must be with digital addressable systems.

1.5 All equipment central to the operation of the digital addressable fire alarm system shall be designed and manufactured by the company installing and commissioning the system. As a minimum requirement, this clause covers the following:

- control and indicating equipment
- repeater equipment
- addressable ancillary equipment
- power supplies and automatic
- point detection equipment. All of which shall shall comply with EN54-13

1.6 The supplier shall be approved to EN ISO 9002 Quality system standard for the design and manufacture of the equipment referred to in clause 1.6.

1.7 The main equipment proposed for use in the digital addressable fire detection and alarm system shall be approved by at least one of the following UK or international organisations:

- Loss Prevention Council (LPC)
- British Standards Institution (BSI)
- Underwriters Laboratories (UL)
- Vertrauen Durch Sicherhelt (VdS)

general requirements

1.8 The Fire Alarm company shall have available a complete set of technical manuals for all equipment installed. This must cover technical specification, system design recommendations and guidelines for installation, commissioning, operating and maintaining the proposed equipment.

For addressable systems a programme should be available for use whereby the designer can verify his design in respect of loop loadings, system loadings, power and standby battery requirements.

1.9 The Fire Alarm company, given reasonable notice, shall permit the buyer, or its nominated agent, to conduct a quality audit at the premises where the proposed equipment is manufactured.

1.10 All variations from this specification that the company proposes to make shall be clearly indicated in writing, making reference to the relevant paragraph(s) of this specification.

standards and specifications

2 Standards and Specifications

2.1 The fire detection and alarm system should incorporate component parts which are approved to the relevant EN54 part No as listed below.

2.2 The installation of the complete system should be installed to a relevant standard which is either the national standard required of the country of installation, where such a standard exists, or

2.3 Where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14

2.4 EN 54-1 Fire detection and fire alarm systems.

2.5 EN 54-2 Control and indicating equipment.

2.6 EN 54-3 Fire alarm devices - Sounders.

2.7 EN 54-4 Power supply equipment.

2.8 EN 54-5 Heat detectors - Point detectors.

2.9 EN 54-7 Smoke detectors- Point detectors using scattered light, transmitted light or ionisation.

2.10 EN 54-10 Flame detectors - Point detectors.

2.11 EN 54-11 Manual call points.

2.12 EN 54-12 Smoke detectors - Line detectors using an optical light beam.

2.13 EN 54-13 compatibility assessment of the systems components

2.14 EN 54-16 Voice alarm control and indicating equipment.

2.15 EN 54-17 Short-Circuit isolators.

2.16 EN 54-18 Input/output devices.

2.17 EN 54-20 Aspirating smoke detectors.

2.18 EN 54-21 Alarm transmission and fault warning routing equipment.

2.19 EN54-23 Fire Alarm Devices. Visual alarm devices. Also, LPCB/FIA document CoP 0001, Code of Practice for visual alarm devices used for fire warning.

2.20 EN 54-24 Components of voice alarm systems – Loudspeakers.

2.21 EN 54-25 Components using Radio Links.

standards and specifications

2.22 CE A4021 Multi-sensor fire detectors - Point detectors using a combination of smoke and heat sensors.

2.23 ISO 7240-8 Multi-sensor fire detectors - Point detectors using a combination of carbon monoxide and heat sensors.

2.24 ISO 7240-15 Multi Sensor Fire Detectors.

2.25 EN 50200 Method of test for resistance to fire of unprotected small cables for use in emergency circuits.

2.26 EN 50281-1-2 Electrical apparatus for use in the presence of combustible dust-Selection, installation and maintenance.

2.27 EN 60079-14 Electrical apparatus for explosive gas atmospheres- Electrical installations in hazardous areas (other than mines).

2.28 EN 60702 Mineral insulated cables and their terminations with a rated voltage not exceeding 750V.

2.29 EN 60702-1 Cables.

2.30 EN 60702-2 Terminations.

control and indicating equipment

3 Control and Indicating Equipment

3.1 General Requirements

3.1.1 The control and indicating equipment shall form the central processing unit of the system, receiving and analysing signals from fire sensors, providing audible and visual information to the user, initiating automatic alarm response sequences and providing the means by which the user interacts with the system.

3.1.2 The control and indicating equipment shall be modular in construction, where appropriate, to allow for future extension of the system.

3.1.3 The control and indicating equipment shall be easily configurable so as to meet the exact detection zone and output mapping requirements of the building.

3.1.4 The control and indicating equipment shall be microprocessor based and operate under a multitasking software program. Operating programs and configuration data must be a) contained in easily up datable non-volatile memory (EEPROM), the use of burnt EPROMS will not be permitted; b) be transferable from a USB memory device without the use of a computer contained in easily up-datable non-volatile memory (EEPROM). The use of 'burnt' EPROM's will not be permitted.

3.1.5 The control and indicating equipment shall incorporate a real-time clock to enable events to be referenced against time and date. This clock shall be accurate to within 1 minute per year under normal operating conditions. The clock must have the facility to compensate for time changes due to summer and winter daylight saving.

3.1.6 It shall be possible for an engineer to perform configuration updates on site by plugging a portable personal computer into the control and indicating equipment. Configuration data shall be retained on the personal computers hard drive and be capable of being backed up on to a central storage system. It shall also be possible, providing a responsible person is present at the Control and Indicating Equipment, for updates to be downloaded from a remote location over TCP/IP.

It shall also be possible to download configurations from a USB memory device without the use of a computer.

3.1.7 The company responsible for the installation shall operate an approved document control system for the retention of configuration data.

control and indicating equipment

3.1.8 The control and indicating equipment shall meet the requirements of EN 54 part 2 and EN 54 part 4 and shall be approved, together with associated ancillary equipment, by an accredited third party certification body.

3.1.9 The control and indicating equipment shall comprise separate processors, cross-monitoring each others correct operation, for the major functions of the systems. In particular, different processors must be used for the main control function, the detection input and alarm output functions, and the display and control function.

3.1.10 The controller shall have the capacity to run up to 1000 addressable devices.

3.1.11 The address code for each addressable device shall be held within the addressable device (ie. detector head, ancillary module, callpoint etc).

3.1.12 Programming of the address code shall be via either the control and indicating equipment or a dedicated programming tool.

3.1.13 The control and indicating equipment shall incorporate a keyswitch to prevent unauthorised use of the manual controls.

3.1.14 The control and indicating equipment shall allow access to any user level by use of a pre-programmed RFID access card.

3.1.15 The control and indicating equipment shall have the means of programming RFID access cards with user and access level information.

3.1.16 The control and indicating equipment shall have an on-board TFT colour display that provides text and graphics.The display shall also be touch sensitive to provide all necessary controls

3.1.17 The control and indicating equipment shall have the capability of displaying up to 240 graphical floor plans that can be linked to individual zones or points and can be displayed when those zones or points are in alarm. Floor plans shall be easily updated by the user via a USB memory device.

3.1.18 The control and indicating equipment in its quiescent state shall display a graphical image. The graphical image shall be easily changed, by the user, using a USB memory device.

control and indicating equipment

3.2 System Configuration

3.2.1 The control and indicating equipment shall be capable of operating with any of the following types of automatic detection equipment:

- conventional detectors
- digital addressable detectors

3.2.2 The control and indicating equipment shall be capable of operating with intrinsically safe conventional detectors and digital addressable detectors suitable for installation in hazardous areas. These devices shall be ATEX approved.

3.2.3 Addressable input and output devices shall be connected to addressable loops capable of accepting up to 250 devices.

3.2.4 The control and indicating equipment shall have a minimum capacity for operating 1 fully loaded addressable loop. This shall be extendible up to a maximum capacity of 8 addressable loops.

3.2.5 Where distributed intelligence is required and where a number of controllers are networked, it should be possible, where panels are located in service riser cupboards, to exclude the full user interface and replace with the following. The panel has no user interface, but an LED status display for Alarm, Fault, Power and System Fault.

3.2.6 The panels shall accommodate batteries of a sufficient ampere-hour capacity to support the selected standby period.

3.2.7 Addressable panels shall be capable of displaying a minimum of 16 zones up to 240 zones for the larger systems. The section of wiring corresponding to each zone circuit shall be protected from faults in other sections by line isolator device. The operation of the line isolator shall be clearly indicated by an led on the device.

3.2.8 It shall be possible to allocate all 250 addressable devices on the loop to a single zone.

3.2.9 In order to facilitate reconfiguration and system extension, the allocation of addresses to devices shall be independent of their physical arrangement on the loops.

3.2.10 In order to facilitate reconfiguration and system extension, the user must (after suitable training) be able to carry out the following functions from the front of the control and indicating equipment.

- change panel text
- change zone text
- change sector text (for networked systems)
- change individual point text
- add addressable devices
- delete addressable devices
- modify addressable devices
- change individual point addresses

control and indicating equipment

These functions must be restricted by the use of a high level pass code as described in 3.4.9.

3.2.11 The control and indicating equipment shall have provision to drive and monitor up to 7 repeater panels providing a repeat of the indications on the control and indicating equipment display and also incorporating the full set of system touch screen user controls.

3.2.12 The control and indicating equipment shall have provision to house the ac mains power supply and batteries required to power systems of up to 80 zones. Zonal indication shall be provided by the use of LED's where required by local standards.

3.2.13 The control and indicating equipment shall have provision for the connection of external power supplies,either local to the control and indicating equipment or distributed throughout the system, to supply power in excess of that stated in clause.

3.2.14 The control and indicating equipment shall have provision for the connection of an 80 character line printer, either locally via a serial port or remotely via an external RS485 Bus.

3.2.15 The control and indicating equipment shall be capable of interfacing directly to an electronic radio paging system.

3.2.16 It shall be possible to connect a PC to the control and indicating equipment to display the information that would otherwise appear on the printer referred to in clause 3.2.14

3.2.17 The control and indicating equipment shall have the facility to enable an onboard communications module to beadded to allow local area networking toother controllers using a copper or fibre optical transmission path.

3.2.18 The control and indicating equipment shall be capable of interfacing with third party equipment via a MODBUS interface.

control and indicating equipment

3.3 Mechanical Design

3.3.1 The housings containing the control and indicating equipment shall be capable of being surface or semi-recessed mounted and shall come complete with cable entries, fixings, knock-outs and covers.

3.3.2 The display component of the control and indicating equipment shall be mounted on a hinged front cover that must not open at an angle greater than 90 degrees to prevent cover damage.

3.3.3 The housings shall afford a minimum ingress protection to IP30.

3.3.4 It shall not be possible to open the control and indicating equipment without the use of a special tool.

3.3.5 The enclosure shall be manufactured from steel or die cast aluminium. No plastic parts shall be permitted.

3.4 Basic System Functions

3.4.1 The control and indicating equipment shall monitor the status of all devices on the addressable loops for fire, short-circuit fault, open-circuit fault, incorrect addressing, unauthorised device removal or exchange, pre-alarm condition,when selected, and contaminated detector condition.

3.4.2 The control and indicating equipment shall monitor the status of all internal connection and interfaces, including charger, battery and remote signalling functions.

3.4.3 The control and indicating equipment shall provide the following discrete visual indications:
Common Fire,Fault, Disable, and Test; power on,mains fault,system fault and day mode. Sounders activated, sounder fault, sounder disabled. Signalling activated, signalling fault,signalling disabled. Protection activated,protection fault, protection disabled.

3.4.4 The system shall provide one LED per fire zone.

3.4.5 In addition to the indications provided in clauses 3.4.3 and 3.4.4, the control and indicating equipment shall also have an integral TFT colour text and graphic display.

3.4.6 The control and indicating equipment shall provide a set of push button controls to enable an authorised operator to perform the following:

control and indicating equipment

EVACUATE.....(actuates ALL alarm sounders in the system)

SILENCE.....(stops all currently actuated alarm sounders)

RESOUND.....(re-activates the alarm sounders)

RESET.....(returns the control and indicating equipment to quiescent condition)

SILENCE BUZZER.....(stops the internal panel sounder)

INVESTIGATE DELAY.....(delays the activation of certain functions for a maximum of 10 minutes while an on-site investigation is carried out)

DAY/NIGHT.....(changes any devices confi gured for day night mode settings to the appropriate mode, e.g. heat detectors du ring the day and combined heat /smoke detectors at night. The day mode also allows the in vestigate delay function to be turned on.)

3.4.7 To prevent unauthorised access or accidental operation of the controls described in clause 3.4.6, the control and indicating equipment shall prevent use of these controls until authorised either by the operation of a Keyswitch, entering a valid password or using a valid pre-programmed RFID card. The effectuate function shall also require confirmation from the user to prevent accidental operation.

3.4.8 The control and indicating equipment shall provide a facility to manually check all the discrete LCD indicators and the TFT display.

control and indicating equipment

3.4.9 The control and indicating equipment shall provide a simple to operate keypad to enable a user to access the various built-in functions, and interact with the information displayed. For security reasons, the control and indicating equipment shall provide a configurable password code facility. The control and indicating equipment shall be capable of providing 99 user access codes each of which can be set to one of six access levels. The access levels should generally be described as:

- Customer Operator
- Customer Manager
- Engineer
- Commissioning Engineer
- Engineer Supervisor
- Engineer R & D

3.4.10 The control and indicating equipment shall provide facilities to drive visual indication LED mimic displays for each of the following zonal status:

- Alarm
- Fault
- Isolated

3.4.11 The control and indicating equipment shall provide facilities for signalling the following system conditions to a remote (ARC) and/or an on-site monitoring centre:

- Alarm
- Pre-alarm
- Fault
- Zone Isolated

3.4.12 The control and indicating equipment shall be capable of monitoring and controlling remote site devices, such as door release units and relays for the control of plants and dampers, directly from the addressable loops.

3.4.13 The control and indicating equipment shall be capable of monitoring fire doors in accordance with the required national standard, such that, in the event of a fire alarm condition, an event is generated to warn of the failure of a fire door to close.

3.4.14 The control and indicating equipment shall provide programmable outputs to activate emergency lighting in the event of a mains supply failure.

control and indicating equipment

3.5 Alarm Monitoring Functions

3.5.1 The control and indicating equipment shall interrogate each addressable device at least once every 5 seconds.

3.5.2 The control and indicating equipment shall incorporate fire decision algorithms specifically adapted to the response characteristics of the digital addressable detectors employed. Algorithm processing in each detector is not desirable.

3.5.3 The algorithms mentioned in clause 3.5.2 shall perform a trend analysis of the signal received from the digital addressable detectors in order that non-fire events may be differentiated.

3.5.4 The control and indicating equipment shall be designed so that, for each type of digital addressable detector, the overall response time, including that for the sensor, the signal transmission system and the fire decision algorithm, meets the requirement of the relevant part of EN54.

3.5.5 The response time of the control and indicating equipment to two-state addressable detectors and conventional detectors shall not exceed 10 seconds.

3.5.6 The control and indicating equipment shall have a special scanning sequence so that designated manual call points provide alarm indication and warning within 3 seconds of operation.

3.5.7 The control and indicating equipment shall have a facility to automatically adjust the sensitivity of addressable detectors to a higher level for periods of time when the building is unoccupied.

3.5.8 The control and indicating equipment shall have, as an optional software enhancement, the ability to annunciate a pre-alarm condition designed to give the earliest possible warning of a potential fire condition without raising the full alarm condition.

3.5.9 The control and indicating equipment shall have, as standard, the ability to automatically adjust the alarm and pre-alarm threshold levels to compensate for changes in detector sensitivity due to contamination over a period of time.

3.5.10 The control and indicating equipment shall have, as standard, the ability to provide automatic warning that a detector has reached a level of contamination which requires that it be replaced or serviced.

control and indicating equipment

3.5.11 The control panel shall have the ability to display the levels returned from the sensors in a meaningful way. i.e. temperature in degrees C, smoke in %/m and carbon monoxide in ppm.

3.6 Alarm Output Functions

3.6.1 The control and indicating equipment shall provide the necessary outputs to separately operate two monitored circuits of common system sounders. Each output shall be capable of driving a sounder load of up to 500mA.

3.6.2 The control and indicating equipment shall be able to monitor and control the integrity of zonal sounder circuits, via a suitable addressable module.

3.6.3 The control and indicating equipment shall be capable of providing a two-stage alarm sounder facility that can be programmed, either on a zonal basis or common system basis. Three possible sound output signals shall be available as follows:

- Alert pulsed tone (1 second ON, 1 second OFF)
- Evacuate continuous tone
- User definable tone for specialised events, for example bomb alert.

3.6.4 The control and indicating equipment shall have the facility to change, on a per sounder zone basis, the sound output signal dependent upon whether the source of alarm is:

- an automatic detector
- a manual call point
- an EVACUATE command
- a non-fire event (for example plant alarm etc.)

3.6.5 The control and indicating equipment shall be capable of generating a signal from a class change input. The signal shall be distinct so as not to be confused with other alarm signals. If common sounders are used for alarm and non alarm signals the alarm signal shall not, in any way, be compromised by the non alarm signal.

3.6.6 The control and indicating equipment shall provide an interface to drive a public address system. The signal from the fire system to the PA/VA system shall be dual path such that, in the event of a failure of the primary signal the public address system defaults to a full evacuation of the protected premises.

control and indicating equipment

3.6.7 The control and indicating equipment shall have the ability to delay the transmission to the Fire Brigade of fire alarm signals from automatic detectors in pre-determined detection zones. The time delay shall be configurable normally up to a maximum time of 2 minutes, but with the capability of being extended to 10 minutes if required.
3.6.8 The control and indicating equipment shall provide the facility to automatically inhibit the delay function described in clause 3.6.7 when the building is unoccupied.

3.6.9 The facility described in clause 3.6.7 shall not apply to alarms generated by manual call points which shall always be transmitted immediately.

3.7 Supervision and Fault Reporting

3.7.1 The control and indicating equipment shall monitor all critical system components and interconnections (internal and external). In the event of a failure occurring which prevents correct operation of the alarm functions, a FAULT indicator will light and a message shall be given on the alphanumeric display within 100 seconds of occurrence.

3.7.2 The following faults shall be reported in the manner described in clause 3.7.1:

- Loop Short Circuit
- Loop Open Circuit
- Unconfigured Device
- Addressable Device Failure
- Device Not Responding
- Incorrectly Configured Device
- Detector power up fault monitoring
- Detector Condition Monitoring Warning
- Auto self test of each detector element
- Conventional Call Point Wiring Open Circuit
- Conventional Call Point Wiring Short Circuit
- Conventional Detector Circuit Wiring Fault
- Repeater/Repeater display, Remote Printer Failure
- PSU Fault
- Charger Fault
- Battery Fault
- Battery Critical
- Mains Failure
- Auxiliary PSU Failure
- Relay Output Inoperative
- Signalling Fault
- Sounder Wiring Open Circuit
- Sounder Wiring Short Circuit

control and indicating equipment

3.7.3 To help rapid fault finding and repair, the control and indicating equipment shall provide text 'messages to indicate the precise location of where a fault has occurred in the system.

3.7.4 The control and indicating equipment shall be capable of monitoring and indicating the status of auxiliary units, such as a remote signalling transmitter. This shall be achieved using a suitable addressable contact monitor module.

3.7.5 With respect to clause 3.7.4, the control and indicating equipment shall have the facility to delay the generation of an event to confirm operation of the monitored device. This shall be either 6 seconds for normal de-bounced contacts, or 40 seconds for fluctuating contacts, e.g. sprinkler flow valve switches.

3.8 System Management Facilities

3.8.1 The control and indicating equipment shall incorporate the following system management facilities:

- Isolate/de-isolate a particular addressable point
- Isolate/de-isolate a particular detector zone
- Isolate/de-isolate a particular sounder zone
- Walk-test of a selected zone to verify detectors and call points
- View the number of alarms since power up
- View the number of software initialisations since power up
- View common alarm status
- View common fault status
- View common disabled status
- View zonal alarm status
- View zonal fault status
- View zonal isolated status
- View point address status
- View / print full event log
- View / print filtered event log
- View / print points isolated
- Print a list of dirty detectors
- Print point statuses

Walk testing sounders using Residual Sounder Monitoring whereby all selected sounders will self test. Defective sounders will report back and display on the control panel. The test will take approximately 15 seconds to complete.

3.8.2 Access to the facilities described in clause 3.8.1 shall be restricted to Customer Manager access level or above.

control and indicating equipment

3.8.3 The system shall allow access to a number of software switches, (MENU POINTS), which,when selected, allows any configured point displayed to be operated by pressing the appropriate number button on the keypad, this will toggle the point from OFF to ON and ON to OFF.

3.8.4 The control and indicating equipment shall have an event log capable of storing up to the last 10000 events that have occurred. It shall be possible to selectively view or print the event log by event type or by time period. It shall also be possible to easily transfer the event log directly from the control panel to a USB memory device, in a format suitable for importing into a spreadsheet for in-depth analysis.

3.8.5 The control and indicating equipment shall be capable of providing audible and visual warning when a weekly system test, is required.

3.8.6 The control and indicating equipment shall be capable, via a suitable timer unit, of isolating a group of selected detectors in areas of the building where maintenance work is carried out. The detectors shall be automatically re-instated after a pre-determined time.

3.8.7 The control and indicating equipment shall have a facility to enable the user to easily change the time and date settings of the system real-time clock.

3.8.8 It shall be possible to provide short circuit wiring fault isolation to every detector on the loop.

3.9 Technical Specification

3.9.1 The control and indicating equipment shall operate on a mains power supply of:

240Vac +10% -6% @ 50 Hz +- 2 Hz or
115Vac +15% -10% @ 50/60 Hz

3.9.2 The control and indicating equipment, standard power supply unit and standard repeater unit shall comply with the following environmental conditions:

Operating temperature range:
-8 C to +55 C

Storage temperature:
-20 C to +70 C

Relative humidity:
up to 95% RH (non-condensing)

IEC protection category:
IP30 minimum

3.9.3 The control and indicating equipment, standard power supply unit and standard repeater unit shall comply with, at least, the EMC requirements described in EN 54 part 2 and EN 54 part 4.

automatic fire detectors

4 Automatic Fire Detectors

4.1 General Requirements

4.1.1 The Fire Alarm company shall have available the following types of automatic detectors for direct connection to the system addressable loops:

- Triple sensing detection (heat, optical smoke & carbon monoxide)
- Optical smoke detectors
- High Performance Optical smoke detectors
- Infra-red flame detectors
- Heat detectors
- Combined Carbon Monoxide/
- Heat fire detectors
- Aspirating smoke detectors
- High Performance Optical smoke detector for hazardous areas
- Infra-red flame detectors for hazardous areas
- Infra-red array flame detectors
- Heat detectors for hazardous areas
- Linear heat detection
- Multi sensor fire detectors

4.1.2 The Fire Alarm company shall have available the following types of conventional automatic detectors, manual call points and ancillary units for connection to the system via suitable interfaces:

- Infra-Red flame detection for hazardous areas
- High Performance optical smoke detectors for hazardous areas
- Heat Detectors for Hazardous areas
- Optical smoke detectors
- High Performance Optical smoke detectors
- Infra-red flame detectors
- Infra-red array flame detectors
- Heat detectors
- Combined Carbon Monoxide/ Heat fire detectors
- Optical beam smoke detectors
- Aspirating smoke detectors
- Linear heat detection

4.1.3 The automatic point fire detectors shall be fixed to the installation by mean of plug-in detector bases. Both the addressable and conventional detectors shall use a compatible base to simplify future upgrades.

4.1.4 The bases specified in clause 4.1.3 shall incorporate the optional feature of being able to lock the detectors in place once plugged in.

automatic fire detectors

4.1.5 For detectors fitted to a false ceiling a suitable adaptor shall be used to allow the assembly and installation of the detector and base to be completed and tested prior to the installation of the ceiling tile.

4.1.6 Addressing of any devices directly connected to the system will be carried out in a manner that does not require manual setting of switches, or the use of programming cards, in either the head or the base.

4.1.7 Addressable detectors must be able to transmit to the control and indicating equipment a pre-set and unique identifier to detect unauthorised changes in the system configuration, and include an optional integral short circuit isolator and both fire and fault led indication.

4.1.8 The system shall be capable of supporting IR communications between the field devices and a hand held management tool, providing assistance in the installation, commissioning, diagnostics and servicing of the detection system. The hand held tool shall allow all the addressable devices to be interrogated, tested and programmed. It's easy-to-navigate options will capture user requirements in an intuitive manner. The device should comply with the requirements of European Standard EN54 parts 2 and 4. and provide the following functionality;

- IR remote control of devices.
- Touch screen Backlit colour LCD display.
- Portable with built in charger.
- Backwards compatible – accepts detectors onto the tool or ancillary programming lead.
- Downloads panel configuration
- Read/write detector/ ancillary addresses
- Displays model number and the software version.
- Displays temperature/ CO levels / smoke obscuration.
- Tests the detector remote LED and control outputs.
- Monitoring ancillary outputs.
- Power management options (not configurable according to customer requirements).
- Read the device status.
- Change the device settings.
- Guide through Commissioning and Service modes.
- Report Generator - Generate reports for Status, Self-test, Reflective Sound Monitoring, Commissioning and Servicing

4.1.9 The Fire Alarm company shall produce standard accessories for installing smoke detectors in air ducts. This equipment shall be designed to accommodate the manufacturer's standard smoke detectors and bases, both conventional and addressable.

4.1.10 It must be possible to connect and mix automatic detectors, manual call points and addressable modules within the same zone sub-division of an addressable loop.

automatic fire detectors

4.1.11 The Fire Alarm company shall have available suitable equipment to test and exchange all four main types of automatic detectors.

4.1.12 The Fire Alarm company shall have available intrinsically safe versions of all four types of automatic detectors, the plug-in bases and the line isolator.

4.1.13 It shall be possible to connect several circuits of intrinsically safe addressable devices to a standard addressable loop via standard BASEEFA approved safety barriers and interfaces from the loop as spurs.

4.1.14 The intrinsically safe devices specified in clause 4.1.2 and shall be designed to comply with EN50014 and EN50020 and be ATEX certificated by BASEEFA to EEx ia IICT5.

4.1.15 The intrinsically safe devices shall be ATEX certified for both gas and dust environments making them suitable for use in Zone 20 and 21 areas.

4.1.16 All equipment connected to the system addressable loops, either directly or via interfaces, shall be proofed against electrical noise, high frequency pulses and electromagnetic influences from other equipment.

4.1.17 The addressable detector base shall be capable of driving a separate alarm LED indicator module. Despite being connected to a specific detector, this LED indicator module must be capable of being programmed to respond to any single detector or a group of detectors as required.

4.1.18 The operating mode of the detectors must be capable of being easily changed to suit the environment / risk present. This should be possible using timers, external inputs or from the front of the control and indicating equipment.

4.2 Triple Sensing Detection

4.2.1 The triple sensing detectors shall be a combination heat, optical smoke and carbon monoxide detection capable of detecting a large range of fires whilst retaining false alarm resilience. The detector shall also be capable of performing as a high sensitivity detector in environments demanding such settings.

4.2.2 The optical smoke detection shall be designed in accordance with the functional requirements of EN 54 part 7.

automatic fire detectors

4.2.3 The heat detection shall be designed in accordance with the functional requirements of EN 54 part 5.

4.2.4 The triple sensing detectors shall be approved and listed by the Loss Prevention Certification Board (LPCB) or Vds..

4.2.5 The triple detector shall be capable of being configured as one or more of the following operating modes.

- High false alarm resiliance (employing all three detection technologies)
- Universal (employing all three detection technologies)
- High performance optical
- A1R Rate of rise heat
- Combined heat and CO
- Toxic gas

4.2.6 The toxic gas mode shall comply with the requirements of EN50291.

4.2.7 The triple detector shall be capable of operating as a single address employing all three detection technologies and as a multiple addressed device using 3 addresses. Using 3 addresses, the detector shall be capable of operating as a fire, smoke and CO toxic gas detector simultaneously.

4.2.8 When employing all three detection technologies the operation of the optical chamber in the triple detector shall be enhanced by the presence of CO and/or heat.

4.2.9 Each detection technology shall be monitored individually such that the failure of a single detecting element must not affect the operation of the remaining two elements.

4.2.10 The optical chamber within the triple detector shall employ the pedestal principle to enhance the monitoring of the chamber and the detector ability to detect both thin burning white smoke and thick black smoke.

4.2.11 The smoke sampling within the optical smoke chamber shall be designed to prevent small insects from creating nuisance alarms, via an permanent mechanical screen designed so as not to impede the movement of smoke.

4.2.12 The triple detectors shall include RFI screening and feed-through connecting components to minimise the effect of radiated and conducted electrical interferences.

4.2.13 The Fire Alarm company shall have available the following versions of the triple detector to meet different applications:

- Digital addressable (adjustable sensitivity)

automatic fire detectors

4.2.14 The triple detector shall incorporate an LED, clearly visible from ground level at all angles. The LED's shall pulse to indicate they are communicating and will light permanently when in alarm. For any areas where complete darkness is required, it shall be possible to programme individual detector LED's not to pulse during the quiescent state.

4.3 Optical Smoke Detectors

4.3.1 The optical smoke detectors shall be capable of detecting visible combustion gases emanating from fires.

4.3.2 The optical smoke detectors shall meet the requirements of BS EN 54 part 7.

4.3.3 The optical smoke detectors shall be approved and listed by the Loss Prevention Certification Board (LPCB) or Vds..

4.3.4 The optical smoke detectors shall employ the forward light-scatter principle, using optical components operating at a wavelength of 4.35nm.

4.3.5 The design of the optical smoke detector sensing chamber shall be optimised to minimise the effect of dust deposits over a period of time.

4.3.6 The optical smoke chamber shall be designed to prevent all but the smaller insects from entering the sensing chamber.

4.3.7 The optical smoke detectors shall be designed to have high resistance to contamination and corrosion, with additional treatment applied to thermistors, and the detector's printed circuit boards. When used in changing environments the detector should be fitted to a deck head mount, offering further resistance to ingress of moisture from above.

4.3.8 The optical smoke detectors shall include RFI screening and feed-through connecting components to minimise the effect of radiated and conducted electrical interferences.

4.3.9 The Fire Alarm company shall have available the following versions of the optical smoke detector to meet different applications:

- Digital addressable (adjustable sensitivity) - Intrinsically safe
- Digital addressable (adjustable sensitivity) - Intrinsically safe
- Conventional
- Conventional - Intrinsically safe

automatic fire detectors

4.3.10 The optical smoke detector shall incorporate an LED, clearly visible from ground level at all angles. The LED's shall pulse to indicate they are communicating and will light permanently when in alarm. For any areas where complete darkness is required, it shall be possible to programme individual detector LED's not to pulse during the quiescent state.

4.4 High Performance Optical Smoke Detectors

4.4.1 The high performance optical smoke detectors shall be capable of detecting visible combustion gases emanating from fires.

4.4.2 The high performance optical smoke detectors shall be designed in accordance with the functional requirements of BS EN 54 part 7.

4.4.3 The high performance optical smoke detectors shall be approved and listed by the Loss Prevention Certification Board (LPCB) or Vds.

4.4.4 The high performance optical smoke detectors shall employ the forward light-scatter principle, using optical components operating at a wavelength of 4.35 nm.

4.4.5 The high performance optical detectors shall monitor and use rapid changes in temperature to increase the normal sensitivity of the light-scatter optical sensor to obtain an improved response to fast burning fires.

4.4.6 The high performance optical smoke detector shall be capable of operating as a single address as detailed in 4.2.9 employing both detection technologies and as a multiple addressed device using 2 addresses. Using 2 addresses, the detector shall be capable of operating as a heat detector and a smoke detector simultaneously thus providing alarm verification in a single detector.

4.4.7 In single address mode, the high performance optical detectors shall not generate an alarm condition from a rate of rise of temperature or absolute temperature alone.

4.4.8 The design of the high performance optical smoke detector sensing chamber shall be optimised to minimise the effect of dust deposits over a period of time.

4.4.9 The optical smoke chamber shall be designed to prevent all but the smaller insects from entering the sensing chamber as detailed in 4.2.11.

4.4.10 The high performance optical smoke detectors shall be designed to have high resistance to contamination and corrosion as detailed in 4.4.8.

4.4.11 The high performance optical smoke detectors shall include RFI screening and feed-through connecting components to minimise the effect of radiated and conducted electrical interferences.

automatic fire detectors

4.4.12 The Fire Alarm company shall have available the following versions of the high performance optical smoke detector to meet different applications:

- Digital addressable (adjustable sensitivity)
- Digital addressable (adjustable sensitivity) – intrinsically safe
- Conventional
- Conventional – intrinsically safe

4.4.13 The high performance optical smoke detector shall incorporate an LED, clearly visible from ground level at all angles. The LED's shall pulse to indicate they are communicating and will light permanently when in alarm. For any areas where complete darkness is required, it shall be possible to programme individual detector LED's not to pulse during the quiescent state.

4.5 Infra-Red Flame Detectors

4.5.1 The infra-red flame detectors shall be capable of detecting infra-red radiation produced by flaming fires involving carbonaceous materials.

4.5.2 The infra-red flame detectors shall be approved and listed by the Loss Prevention Certification Board (LPCB).

4.5.3 The infra-red flame shall be able to detect a fuel fire of 0.1 square meter area from a distance of 30 meters for the following fuels:

- Petrol (gasoline)
- N-heptane
- Kerosene
- Diesel oil
- Alcohol (I.M.S)
- Ethylene glycol

4.5.4 The infra-red flame detectors shall employ narrow band optical filters that block unwanted radiation such as that emanating from the sun or tungsten filament lamps. The flame detector must be immune from direct or reflected sun radiation and from 1kW modulated radiated heat up to 1m.

4.5.5 The infra-red flame detectors shall be designed to be sensitive to modulation of the received radiation in a small range of frequencies corresponding to the flicker of flames.

automatic fire detectors

4.5.6 The infra-red flame detectors shall be designed to have high resistance to contamination and corrosion.

4.5.7 The electronic assembly of the infra-red flame detectors shall be encapsulated in high resistivity epoxy resin.

4.5.8 The infra-red flame detectors shall include RFI screening and feed-through connecting components to minimise the effect of radiated and conducted electrical interferences.

4.5.9 The Fire Alarm company shall have available the following versions of infra-red flame detectors to meet different applications:

- Digital addressable
- Digital addressable – intrinsically safe
- Digital addressable – type 'n' approved
- Conventional
- Conventional – intrinsically safe

4.5.10 The infra-red flame detector shall incorporate an LED, clearly visible from the outside, to provide indication of alarm actuation.

4.5.11 The detectors range shall allow detection of a 0.1m^2 pan fire at a distance of 60 metres. The unit will provide outputs allowing connection into third party systems using 4-20mA, Modbus and other protocols together with a relay output for connection to conventional systems.. The detector will have the capability to incorporate a CCTV camera within the detector housing which connects over twisted pair to a proprietary CCTV system and which transmits live images of the detectors field of view.

4.6 Infra Red Array Flame Detection

4.6.1 The IR array flame detectors shall detect flames using an IR array with a resolution of 256 x 256. To protect against false alarms the flame detectors must have a wide band IR guard channel and a sunlight detector.

4.6.2 The IR array flame detector must be capable of reporting pre-alarms and areas of interest where a heat build up is seen. It must be able to identify up to 4 distinct fires in the field of view and report the size of the effect on the sensing array and if they are getting bigger or smaller. The bigger and smaller is by inference from the size.

automatic fire detectors

4.6.3 The IR array flame detectors must be able to heat the detection window to keep them clear of condensation. The detectors shall also monitor the window for cleanliness and report when the window needs to be cleaned.

4.6.4 The IR array flame detectors shall have a consistent response across their field of view (90° horizontally).

4.6.5 It shall be possible to test the detector in-situ within a hazardous environment without needing poles to reach it. The detector must be capable of being tested using an intrinsically safe hand held unit which triggers the detector to run tests of the optics (window cleanliness) and alarm function using IR sources built into the detector.

4.6.6 IR array flame detectors shall be CE marked and approved by ATEX and IECEx for use in Gas and Dust environments.

4.6.7 IR array flame detectors shall be capable of communicating via multiple outputs within the same unit. These outputs being:

- 4-20 mA, current sink or source
- Fire and Fault relays
- Two RS485 communication lines
- Mod bus interface

4.6.8 As an option, in addition to the automatic detection of flames using an IR array, the detector must be capable of containing a CCTV camera in the same housing. The picture from this camera shall have highlighted on it detector status information and the location of a fire if one should be detected.

4.6.9 The IR array flame detectors shall keep a history log which should include all alarm and fault events. The detector shall log the array information for at least 5 seconds immediately prior to a fire alarm being triggered. Access to the history log shall be possible remotely from the detector via an RS485 communications bus as well as locally.

4.6.10 It shall be possible in software to mask out an area of the field of view to prevent unwanted alarms. This mask should be easily applied to an area where the detector has had an unwanted alarm as well as by the operator selecting an area manually. The use of the mask should be selectable via the PLC link, if used, so for instance the mask can be applied while a process is running but not enabled when process is not. This enables the best possible protection while eliminating unwanted alarms.

automatic fire detectors

4.6.11 The detector housing should be 316L Stainless Steel and be rated at IP66/67.

4.6.12 The detector shall be capable of operating in the following environmental conditions.

- Detectors without camera
- Operating temperature range: -40°C to +80°C
- Storage temperature range: -40°C to +80°C
- Relative humidity: Up to 99% (non-condensing)
- Detectors with camera
- Operating temperature range: -10°C to +50°C*
- Storage temperature range: -20°C to +70°C
- Relative humidity: Up to 99% (non-condensing)

Note: *The detector will turn the camera off if the temperature goes outside this range but fire detection capability is still present when the video is switched off.

4.7 Heat Detectors

4.7.1 The heat detectors shall be capable of detecting rapid rise in temperature and fixed absolute temperatures.

4.7.2 The heat detectors shall meet the requirements of EN 54 part 5.

4.7.3 The heat detectors shall be approved and listed by the Loss Prevention Certification Board (LPCB) or Vds.

4.7.4 The heat detectors shall employ two heat sensing elements with different thermal characteristics to provide a rate of rise dependent response.

4.7.5 The temperature sensing elements and circuitry of the heat detectors shall be coated with epoxy resin to provide environmental protection.

4.7.6 The heat detectors shall include RFI screening and feed-through connecting components to minimise the effect of radiated and conducted electrical interferences.

automatic fire detectors

4.7.7 The Fire Alarm company shall have available the following versions of the heat detectors to meet different applications:

- Digital addressable (adjustable sensitivity)
- Digital addressable (adjustable sensitivity) – intrinsically safe
- Conventional
- Conventional – intrinsically safe

4.7.8 The heat detector shall incorporate an LED, clearly visible from ground level at all angles. The LED's shall pulse to indicate they are communicating and will light permanently when in alarm. For any areas where complete darkness is required, it shall be possible to programme individual detector LED's not to pulse during the quiescent state.

4.8 Linear Heat Detectors

4.8.1 The linear heat detectors shall be capable of detecting fire (or overheat) conditions in confined or polluted areas.

4.8.2 The sensor cable of the linear heat detectors shall be unaffected by dust, moisture or vibration and require little maintenance.

4.8.3 The detectors shall have a calibration switch mounted internally to set the alarm sensitivity threshold.

4.8.4 The detectors shall generate an alarm condition if the pre-determined alarm threshold is exceeded.

4.8.5 The detectors shall generate a fault condition if the sensor cable has an open or short circuit condition present.

4.8.6 The detectors, upon detecting a cable open or short circuit or fault, shall be capable of signalling the condition to the main fire controller.

4.8.7 The linear heat detectors shall meet the requirements of EN54-5.

4.9.8 The linear heat detectors shall be approved and listed by the Loss Prevention Certification Board (LPCB) or Vds.

4.8.9 The detectors shall be suitable for use in hazardous areas and have mechanical protection for cables in areas where damage may occur.

4.8.10 The detectors shall incorporate red Fire and yellow Fault LED's, clearly visible from the outside, to provide indication of alarm condition.

automatic fire detectors

4.9 Beam Smoke Detectors

4.9.1 The beam smoke detectors shall be capable of detecting the presence of smoke in large open-type interiors.
4.9.2 Either point to point or reflective beam smoke detectors will be utilised.

4.9.3 The beam smoke detectors shall project a modulated infra-red light beam from a transmitter unit to a receiver unit. The received signal shall be analysed and, in the event of smoke being present for a pre-determined period, an alarm condition is activated.

4.9.4 The detectors shall be capable of providing cover in open areas up to 100m in length and up to 14m wide, giving an effective protection area of up to 1400sq m.

4.9.5 The fire alarm output of the detectors shall be activated in the event of smoke reducing the signal strength between 40% and 90% for a period of approximately 5 seconds.

4.9.6 In the event of a power failure at the transmitter unit or if the transmitted signal is reduced by more than 90% for a period in excess of 1 second, then a fault alarm condition shall be indicated. This condition shall inhibit the fire alarm until the signal is restored.

4.9.7 The receiver unit of the detectors shall be capable of performing an automatic reset, approximately 5 seconds after a fault is indicated, if the fault is no longer present.

4.9.8 The detectors shall include Automatic Gain Control (AGC) circuitry capable of providing compensation for long-term degradation of signal strength caused by component ageing or build-up of dirt on the optical surfaces of the transmitter and receiver unit lenses.

4.9.9 The beam smoke detectors shall meet the requirements of EN54-12.

4.9.10 The beam smoke detectors shall be approved and listed by the Loss Prevention Certification Board (LPCB) or Vds.

4.9.11 The receiver unit of the detectors shall incorporate an alignment/fault lamp, clearly visible from the outside, to provide indication of both alignment and fault conditions.

automatic fire detectors

4.9.12 The preferred beam type smoke detector would have an integral auto aligning feature, designed to realign the unit with its reflector if due to building movements the two components are misaligned. The feature is also an aid to the initial installation and commissioning

4.9.13 For Atria and other similar roof spaces Open Area Smoke Detection Imaging is the preferred detection. This overcomes the weaknesses of some beam detectors due to its aesthetics and multi-emitter capability, providing 3D coverage of the area.

A system can consist of up to seven Emitters and one Imager placed on opposite walls, roughly aligned with one another. Emitters can be battery-powered or wired and are placed at different heights, adjusting easily to modern design of atria. Three Emitters will cover an area of up to 600m^2 and five Emitters to 2000m^2, all using just a single 80-degree Imager. In addition, Open Area Smoke Detection Imaging offers many advantages over traditional beam smoke detectors, the primary one being the use of dual light frequencies. Ultraviolet (UV) and infrared (IR) wavelengths assist in the identification of real smoke compared to larger objects such as insects and dust, thus reducing false alarms.

Furthermore, Open Area Smoke Detection Imaging is equipped with a CMOS imaging chip with many pixels rather than a single photo-diode. This concept allows the Imager to provide simple alignment as well as excellent tolerance to building movement and vibration, without the use of moving parts.

Open Area Smoke Detection Imaging provides, new levels in stability and sensitivity while providing greater immunity to high-level lighting variability, allowing it to provide extra stability in sunlit areas such as atria. The Open Area Smoke Detection Imaging should be integrated with the building fire alarm system.

automatic fire detectors

4.10 Aspirating Smoke Detectors

4.10.1 The aspirating smoke detectors shall be capable of detecting the presence of smoke particles in air samples drawn from many different locations.

4.10.2 The aspirating smoke detectors shall provide a continuous analogue profile of ambient air conditions.

4.10.3 The detectors shall be capable of responding to a developing fire situation with multiple staged alarms.

4.10.4 The fire alarm output of the detectors shall be programmable to allow sufficient time for action to be taken; from a detailed investigation of the cause of the alarm to a full-scale evacuation.

4.10.5 The design of the detectors shall be such that they can be integrated with a fire alarm system and guard against specific pieces of equipment, such as computers, equipment racks, power boards and telecommunications switching racks, as well as entire rooms or floors.

4.10.6 The detectors shall include a facility to allow sensitivity threshold adjustments to suit the needs of particular environments.

4.10.7 Each detector shall be capable of monitoring an area up to 2000 sqm using easy to install ABS pipe.

4.10.8 The aspirating smoke detectors shall be approved to EN 54-20 and listed by the Loss Prevention Certification Board (LPCB).

4.10.9 The detectors shall incorporate an LED indicator, clearly visible from the outside, to provide indication of alarm or fault condition.

4.10.10 Where there is a requirement for gas detection in addition to aspirating smoke detection, it shall be possible to provide this through the same system of pipe work as that used for the fire detection. The system should be capable of detecting a range of flammable, toxic and oxygen gas hazards and provide a greater area of coverage than fixed point gas detection systems. The system would be restricted for use in indoor in non 'Hazardous' classified areas only. The gas detector(s) shall have a sensor cartridge containing 1 or 2 gas sensors using industry proven electrochemical & catalytic sensors.

Amongst the detectable gases will be, Carbon Monoxide,Nitrogen Dioxide, Ammonia, Oxygen, Sulphur Dioxide, Hydrogen Sulphide, Hydrogen, Methane and Propane. Other gases can be added on request. The system shall be capable of integration to third party systems using the protocols available, including 4-20mA, modbus and serial RS485. As gas detectors require regular calibration the system shall incorporate an advanced warning that this is due.

automatic fire detectors

4.11 Carbon Monoxide/Heat (CH) Fire detector

4.11.1 The Carbon Monoxide/Heat (CH) fire detectors shall be designed to provide early warning of a slow smouldering fire whilst reducing the incidences of false alarms. The detector shall incorporate an integral heat sensor, as described in 4.12.4.
4.11.2 The CH detectors shall be approved and listed by the Loss Prevention Certification Board (LPCB) and meet the requirements of ISO 7240-8.

4.11.3 The detectors shall have a high tolerance of where they can be sited due to the diffusion nature of the gas.

4.11.4 The CH detectors shall monitor and use rapid changes in temperature to increase the normal sensitivity of the CO sensor to obtain an improved response to fast burning fires where, typically, the levels of CO would be reduced.

4.11.5 The CH detector shall be capable of operating as a single address employing both detection technologies and as a multiple addressed device using 2 addresses. Using 2 addresses, the detector shall be capable of operating as a heat detector and a CH detector simultaneously thus providing alarm verification in a single detector.

4.11.6 The detector shall not be affected by the build up of dust deposits.

4.11.7 The detector shall not be affected by insects.

4.11.8 The detectors shall be designed to have high resistance to contamination and corrosion.

4.11.9 The detectors shall include RFI screening and feed-through connecting components to minimise the effect of radiated and conducted electrical interference.

4.11.10 The Fire Alarm company shall have available the following versions of the detector to meet different applications:

- Analogue addressable – adjustable sensitivity
- Conventional - normal sensitivity

4.11.11 The detector shall incorporate an LED, clearly visible from ground level at all angles. The LED's shall pulse to indicate they are communicating and will light permanently when in alarm. For any areas where complete darkness is required, it shall be possible to programme individual detector LED's not to pulse during the quiescent state.

automatic fire detectors

4.12 Remote Indicator Module

4.12.1 The remote indicator module shall provide a remote indication for any conventional or analogue addressable detector that may be located in an enclosed or locked compartment.

4.12.2 The remote indicator module shall be driven directly from its associated local detector.

4.12.3 The connection to the remote indicator module shall be monitored for open and short-circuits.

4.12.4 Despite being connected to a specific detector, the LED indicator module must be capable of being programmed to respond to any single detector or a group of detectors as required.

associated ancillary equipment

5 Associated Ancillary Equipment

5.1 General Requirements

5.1.1 The Fire Alarm company shall have available the following types of manual call points and line modules for direct connection to the system addressable loops:

- Manual call points for indoor use
- Manual call points for outdoor use
- Conventional detector interface module
- Addressable relay interface module
- High voltage relay module
- Addressable contact monitoring module
- Addressable input/ output module
- Addressable door control module
- Addressable sounder driver module
- Addressable loop powered sounder module
- Addressable power supply module
- Line isolator module
- Addressable Loop Powered Sounder/Beacon
- Addressable Loop Powered Sounder Base
- Addressable 4-20mA monitoring module
- Quad Monitored input/output modules providing the following options, 4 inputs & 4 outputs, 2 outputs, 4 outputs, 2 relay outputs, 4 relay outputs

5.1.2 The Fire Alarm company shall have available an intrinsically safe version of the addressable contact monitoring module for connection of 'simple apparatus' such as conventional manual callpoints.

5.1.3 The intrinsically safe device specified in clause 5.1.2 shall be designed to comply with EN50014 and EN50020 and be ATEX certificated by BASEEFA to EEx ia IICT5. 4.1.15 All equipment connected to the system addressable loops, either directly or via interfaces, shall be proofed against electrical noise, high frequency pulses and electromagnetic influences from other equipment.

5.2 Addressable Manual Call Points

5.2.1 The addressable manual call points shall monitor and signal to the control and indicating equipment the status of a switch operated by a 'break glass' assembly.

5.2.2 The addressable manual call point shall meet the requirements of EN 54: Part 11

5.2.3 The addressable call points shall be capable of operating by means of thumb pressure and not require a hammer.

associated ancillary equipment

5.2.4 The addressable call points shall be capable of being mounted in weatherproof enclosures affording protection to IP65.

5.2.5 The addressable call points shall incorporate a mechanism to interrupt the normal addressable loop scan to provide an alarm response within less than 3 seconds.

5.2.6 The addressable call points shall be field programmable to trigger either an alert or an evacuate response from the control and indicating equipment

5.2.7 The addressable call points shall be capable of being tested using a special 'key' without the need for breaking the glass.

5.2.8 The addressable call points shall provide an integral red LED to indicate activation.

5.3 Conventional Detector Interface Module (Including 4-20mA Monitoring)

5.3.1 The conventional detector interface module shall monitor and signal to the control and indicating equipment the status of up to two circuits of conventional detectors and manual call points.

5.3.2 The conventional detector interface module shall be able to distinguish between automatic conventional detectors and manual callpoints on the same circuit for the purposes of alams and isolations.

5.3.3 The conventional detector interface module shall be able to signal alarm, open-circuit fault, short-circuit fault and power supply fault status.

5.3.4 The conventional detector interface module shall be capable of monitoring automatic detectors and manual call points from a range of existing conventional systems.

5.3.5 The conventional detector interface module shall operate such that removal of an automatic conventional detector from its base shall not effect the operation of any manual callpoint.

5.3.6 The conventional detector interface module shall incorporate an integral line isolator.

5.3.7 The conventional detector interface module shall provide integral red LED indication when in the alarm state and amber LED indication when the on-board line isolation has operated.

associated ancillary equipment

5.3.8 The conventional detector interface module shall be capable monitoring two 4-20mA inputs, sink or source, for the purposes of interfacing proprietary 4-20mA devices e.g. gas detectors.

5.3.9 The conventional detector interface module shall be capable of monitoring ATEX approved intrinsically safe conventional automatic detectors and manual callpoints via external galvalic isolation.

5.4 Addressable Relay Output Module

5.4.1 The addressable relay output module shall provide a volt free changeover relay contact operated by command from the control and indicating equipment

5.4.2 The contacts of the addressable relay output module shall be rated at a minimum of 2 Amps at 24Vdc.

5.4.3 The addressable relay output module shall monitor the relay coil for open-circuit and transmit the fault signal to the control and indicating equipment.

5.4.4 The addressable relay output module shall be capable of deriving its operating power from the addressable loop.

5.4.5 The addressable relay output module shall provide a red LED indication that the relay has operated.

5.4.6 The addressable relay output module shall also be capable of driving an external high voltage relay module.

5.5 Addressable Contact Monitoring Module

5.5.1 The addressable contact monitoring module shall provide monitoring of the status of switched input signals from either normally open or normally closed contacts.

5.5.2 The addressable contact monitoring module shall provide a red LED indication when the contact has operated.

5.5.3 The addressable contact monitor module shall be capable of deriving its power directly from the addressable loop.

5.6 Addressable Sounder Notification Module

5.6.1 The output of the addressable sounder notification module shall be rated at 500mA and shall be capable of operating both sounders and visual alarm devices..

5.6.2 The addressable sounder notification module shall be capable of operating the sounders in a pulsing or continuous mode as determined by the control and indicating equipment.

associated ancillary equipment

5.6.3 The addressable sounder notification module shall provide the facility to monitor the wiring to the sounders for open or short-circuit and transmit the necessary fault signal to the control and indicating equipment.

5.6.4 The addressable sounder notification module shall provide the facility to monitor for failure of the power supply for the sounders and transmit the necessary fault signal to the control and indicating equipment.

5.6.5 The addressable sounder notification module shall provide a red LED indication that the sounder circuit has been actuated.

5.7 Loop Powered Addressable Sounder Notification Module

5.7.1 The loop powered addressable sounder module shall comply with all the requirements listed in section 5.6.

5.7.2 The loop powered addressable sounder module shall be capable of deriving its power directly from the addressable loop.

5.7.3 The loop powered addressable sounder module shall be capable of providing 24Vdc up to a maximum of 75mA.

5.8 Sounder Booster Module

5.8.1 The sounder booster module shall be capable of monitoring and driving a heavy duty circuit of sounders and/or visual alarm devices up to 15 Amp.

5.8.2 The sounder booster module shall be capable of interfacing either to the common sounder outputs of the control and indicating equipment or to the output of the addressable sounder driver module.

5.8.3 The sounder booster module shall be designed to maintain the monitoring of the sounder circuit and transmit a fault signal either via the addressable sounder module or directly to the control and indicating equipment.

associated ancillary equipment

5.9 Auxiliary power supplies.

Where additional and remote, to the main system, power supply units are installed these should be installed in accordance with the current code of practice, and be tested and approved to EN54-4. An auxiliary power supply should be typically as specified below.

The MXP24/50 PSU is approved by IMQ to EN 54-4:1997 + A1:2002 and EN60950-1:2001. The steel housing contains a 5 amp switch mode power supply and monitoring board and has space to accommodate 2 x 12V 17Ah sealed lead acid batteries. The 10 front panel LED's comprehensively indicate the status of the unit. The unit will be addressable and monitored by the system main Control and Indicating Equipment.

5.10 Line Isolator

5.10.1 Where isolators are integral to the detector then the base shall employ a mechanical switch to provide loop continuity when the detector is removed. Where heat, smoke or multisensor detectors are installed line isolators should be integral to each detector.

Where automatic detection is not installed then discrete isolators or isolators integral to ancillary modules should be used. Addressable sounders should incorporate integral line isolators.

5.10.2 The line isolator module shall provide protection on the addressable loop by automatically disconnecting the section of wiring where a short-circuit has occurred.

5.10.3 The line isolator module shall derive power directly from the addressable loop.

5.10.4 The line isolator module shall provide an LED indication that the module has tripped.

5.11 Door Control Module

5.11.1 The door control module shall comply with the requirements of the national standard required of the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14. The module must, therefore, be fail safe in the following conditions:

- removal of a detector that will effect the correct operation of the door control module
- isolation of a detector that will effect the correct operation of the door control module
- isolation of the door control module
- an open or short circuit on the cabling that forms part of the critical signal path (eg. the addressable loop)

associated ancillary equipment

5.11.2 The door control module shall provide an output required to control a hold open fire door device, an electromagnetic release on a means of escape, or a sliding door on a means of escape.

5.11.3 The door control module shall also provide a programmable input that could be used to either monitor an emergency breakglass callpoint that will activate the door control module or to monitor the closure of the door. The module shall, however, take only one address on the addressable loop.

5.11.4 The door control module shall be fully addressable and provide one volt-free changeover relay contact rated at 24Vdc @ 2 Amps.

5.11.5 The door control module shall incorporate an integral line isolator.

5.11.6 The changeover relay contact of the door control module shall be monitored and controlled by commands signalled from the fire alarm system control panel via the addressable loop.

5.11.7 The module shall derive its power directly from the addressable loop.

5.11.8 The door control module shall have a red LED, clearly visible on the fascia panel of the unit, to provide an indication of relay operation.

5.12 Multiple Input / Output Module

5.12.1 The multiple input / output module shall provide all 3 inputs and 4 outputs to interface, for example, individual shop units with a landlords site-wide monitoring system.

5.12.2 The multiple input / output module shall be fully addressable and provide 2 volt-free changeover relay contacts rated 24Vdc @ 2A and 4 outputs to operate an external high voltage relay interface rated at 240Vac @ 10A.

5.12.3 The changeover relay contacts of the multiple input / output module shall be monitored and controlled by commands

signalled from the monitoring system control panel via the addressable loop.

5.12.4 The multiple input / output module shall be capable of monitoring multiple external relay contacts.

5.12.5 The module shall derive its power directly from the addressable loop.

5.13 Quad Modules

5.13.1 The quad input/output module shall provide 4 monitored inputs and 4 c/o relay outputs. The module shall also provide 4 high voltage relay drivers (outputs) which allows connection to high voltage relay modules. The module shall derive its power from the loop.

associated ancillary equipment

5.13.2 The quad monitored output module shall provide 4 monitored outputs for connection to conventional sounder circuits or auxiliary relays. The module will require an external 24volt dc supply.

5.13.3 The quad relay output module shall provide 4 c/o relay outputs or 4 high voltage relay drivers (outputs) which shall allow connection to external high voltage relay modules. The module shall derive its power directly from the loop.

5.13.4 All quad modules shall be mounted within a polystyrene/ poly carbonate, IP66 rated, housing containing a din rail for ease of mounting. A transparent front cover shall provide visibility of all of the modules status leds.

5.14 Single Input / Output Module

5.14.1 The single input / output module shall provide an input and an output. The module shall, however, take only one address on the addressable loop.

5.14.2 The operation of the input and the output shall be independent (ie. the output must not have to follow the input).

5.14.3 The single input / output module shall be fully addressable and provide a volt-free changeover relay contacts rated 24Vdc @ 2A.

5.14.4 The changeover relay contacts of the single input / output module shall be monitored and controlled by commands signalled from the monitoring system control panel via the addressable loop.

5.14.5 The single input / output module shall be capable of monitoring a single external relay contact.

5.14.6 The module shall derive its power directly from the addressable loop.

5.15 Loop Powered Beam Detector Module

5.15.1 The loop powered beam detector module shall provide power to, and monitor the fire and fault outputs of, infra red optical beam detection.

5.15.2 The loop powered beam detector module shall derive its power directly from the addressable loop.

5.15.3 The loop powered beam detector module shall be capable of powered and monitoring reflective and point to point beam detection.

5.15.4 The loop powered beam detector module shall be capable of monitoring multiple external relay contacts.

5.15.5 The loop powered beam detector module shall have a red LED, clearly visible on the fascia panel of the unit, to provide an indication of relay operation.

associated ancillary equipment

5.16 Addressable Loop Powered Sounder / Beacon

5.16.1 The loop powered sounder shall be capable of producing a sound output of 103dB at 1m.

5.16.2 The loop powered sounder shall have the option of an integral LED beacon, complying with the requirements of EN54-23 -O". Both type A, indoor and type B outdoor devices shall be provided where appropriate.

5.16.3 The loop powered sounder shall have two volume settings, 16 selectable tones and two flash rates (for the LED beacon).

5.16.4 The volume and the tone settings shall be configured by software during system configuration and commissioning. The facility to change the volume and tone settings shall not be available in the sounder.

5.16.5 An IP65 weatherproof version of the sounder and sounder beacon shall be available.

5.16.6 The internal sounders and sounder beacons shall be available in red or white.

5.16.7 The loop powered sounder/ beacon shall incorporate an integral line isolator.

5.16.8 The loop powered sounder shall be self monitoring such that if the sounder fails to operate during a test or genuine fire activation, an appropriate fault message is displayed on the control and indicating equipment.

5.16.9 The loop powered sounder/ beacon shall derive its power directly from the addressable loop.

associated ancillary equipment

5.17 Addressable Loop Powered Sounder/Beacon Base

5.17.1 The loop powered sounder base shall have a volume range between 68dB and 100dB at 1m and 8 selectable tones.
5.17.2 The loop powered sounder base shall have a volume range between 60dB and 90dB at 1m.

5.17.3 The loop powered sounder base shall have the option of an integral LED beacon which shall be visible from 36 0° and be fully compliant with EN 54-23 -O.

5.17.4 The loop powered sounder/ beacon base shall have four volume settings, 15 selectable tones and two flash rates (for the LED beacon).

5.17.5 The volume, tone settings and flash rate shall be configured by software during system configuration and commissioning. The facility to change the volume and tone settings shall not be available in the sounder.

5.17.6 The loop powered sounder/ beacon base shall incorporate an integral line isolator.

5.17.7 The loop powered sounder base shall be self monitoring such that if the sounder fails to operate during a test or genuine fire activation, an appropriate fault message is displayed on the control and indicating equipment.

5.17.8 The loop powered sounder/ beacon base shall derive its power directly from the addressable loop.

5.17.9 The loop powered sounder/ beacon base shall have independent addresses for the sounder and beacon such that they can be individually controlled and isolated by the control and indicating equipment.

5.17.10 All loop powered beacons shall be synchronised so as to, as far as is practicable, avoid creating a situation whereby photo epilepsy could be induced in a person confronted by multiple beacons within their line of sight.

associated ancillary equipment

5.18 Conventional Sounder/ Sounder Visual Devices.

5.18.11 Conventional devices shall be connected to the addressable loop via the loop powered addressable sounder notification module or the addressable sounder notification module.

5.18.12 Xenon beacons and other high powered sounder visual devices shall be connected to the loop through a sounder booster module , connected to a addressable sounder notification module. The sounder booster module shall be connected to an appropriate 24volt dc. external power supply, complete with standby battery.

5.19 High Voltage Relay Module

5.19.1 The high voltage relay module shall be a non addressable device capable of switching up to 10 amp at 240volts ac.

5.19.2 The high voltage relay module shall connect to the relay interface module , or the quad monitored output or the quad monitored relay output modules.

5.19.3 The high voltage relay module shall connect to the appropriate module via it opto- isolated input.

cables

6 Cables

6.1 Type

6.1.1 Fire Alarm Circuits, loops and spurs, should be adequately protected so as to limit the numbers of devices that may become inoperative due to a cable fault. Short circuit isolators should be installed into fire alarm circuits so as to minimise the effects. As a minimum the number installed should be in accordance with the limitations laid down in the national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14.

In addition the design limitations of the system should ensure that circuits are not overloaded such as to create volt drop which is also likely to cause similar problems.

The use of short circuits isolators placed strategically around the circuit will limit the effects of either of the above conditions.

In addition the use of fire resistant cable complying with the requirements of EN50200 will offer further protection to the circuits should cable be exposed to the effects of fire. The use of such cables may also lead to a lesser number of short circuit isolators being required.

networking and graphics

7 Networking and Graphics

7.1 Sub Panels

7.1.1 The system must be capable of supporting up to 99 sub panels/ graphic stations and provide a seamless, integrated graphical mimic with full alarm management and panel control capability.

7.1.2 The network must be a true peer to peer network whereby the failure of a single node will not affect the operation of any other node on the network. Similarly, failure of a panel's central processor unit will not inhibit transmission of any fire alarm or fault signal from that panel around the network to a designated panel's zonal display.

7.1.3 The network must be, EN54-2 and EN54-13 approved.

7.1.4 The network must be capable of being wired in MICC cable with up to 1000m between nodes.

7.1.5 Nodes must be peer to peer with no master panel.

7.1.6 The network must be capable of supporting a maximum distance of 4000m between nodes using cables other than MICC.

7.2 Graphical User Interface

7.2.1 The Fire Alarm company shall be responsible for the design, supply, installation, commissioning configuration and servicing of a graphical user interface for the fire detection system.

7.2.2 The graphical user interface software shall be designed, written and owned by the company configuring and commissioning the fire detection and alarm system.

7.2.3 The software shall control the operations, functions and display of the graphics system and provide for automatic boot up and run from the hard disk drive of the computer. A software security facility shall be provided to prevent unauthorised access to the operating system, drives, or configuration menus. The software shall include an automatic database rebuild utility to aid system recovery in the event of unexpected system failure.

7.2.4 All project specific actuating device programming shall be capable of being carried out on site via password access.

7.2.5 TXG is designed to run on a currently supported version of the windows® operating system.

7.2.6 The graphical user interface shall provide the means for annunciation, status display, and control of the fire detection system.

networking and graphics

7.2.7 The graphical user interface software shall be a true Client / Server application and enable up to 5 secure clients to access one central configuration database, add via TCP/IP.

7.2.8 The system shall have the capacity to sequence up to 2000 simultaneous alarms, faults, and circuit/point, isolate events. The system shall be capable of automatically displaying a device specific custom message of 70 characters for each actuating device connected to the fire alarm control panel.

7.2.9 When an event is registered at any fire alarm control panel the graphics system shall display the first screen image for the first actuated device. The option shall be available to display the first screen image for the most recent fire alarm if required. The system shall be capable of zooming in for further information up to ten (10) times if required. At all times when in the alarm or fault mode the fire control panel status i.e. number of current alarms and/or faults is to be displayed on the graphics screen.

7.2.10 It shall be possible to easily and quickly isolate whole sections of the fire detection network for a set period of time, for maintenance purposes. Events generated by devices that have been handed off shall not be alerted to the operator. However, these events shall be logged in the same manner as all other events and actuations. Once initiated, the operator shall have the capacity to override the handoff manually at any time.

7.2.11 All security administration and operator accounts shall be administered centrally through the client's common database.

7.2.12 The graphical user interface shall have a minimum of 8 operator access levels to prevent unauthorised access into specific areas of the system.

7.2.13 The graphical user interface shall support a network of 99 control panels / graphical user interfaces with 1000 addressable points connected to each control panel.

7.2.14 Multiple workstations shall be configurable for either specific functions or redundant operation.

7.2.15 Response buttons with recognizable icons shall provide control switches specific to any operation being performed.

7.2.16 The graphical user interface shall provide operator control via a mouse, keyboard or touch-screen with full multimedia compatibility.

7.2.17 The system should support the connection of a separate monitor to enable Graphics and Text alarms to be displayed on separate screens if required.

networking and graphics

7.2.18 The graphical user interface shall display the precise location of events and give instructions on what emergency action should be taken using a combination of symbols, floor plans, pictures text, audio and video to communicate.

7.2.19 The graphical user interface configuration software shall support all standard PC picture file types (i.e. GIF, JPG), AutoCAD® & Vector file types.

7.2.20 In order to assist operators and response teams the graphical user interface shall be capable of printing maps and instructions on local or networked printers.

7.2.21 The graphical user interface shall store a history log of all events centrally. The graphics system shall monitor all alarms, Circuit/Point activations, faults, Ancillary and Isolate events detected by any fire alarm control panel and provide disk based log files of these events. These logs may be enabled, disabled, or cleared with password access. These log files are to be continually appended with events so as to provide complete historical information of all alarms and faults. This log information is not to be lost upon power failure or fire alarm control panel reset. The history log shall be recallable or printable by event type, date, time, date range, time range, device address, address range, device type, device location or text description.

7.2.22 Streaming video feeds from on-site IP based CCTV cameras shall be able to be displayed on the graphical system. The video feeds shall display automatically on annunciation of a relevant alarm. The operator shall also be able to view the video feeds manually.

7.2.23 Events handled by the graphical user interface shall be either accepted individually or universally as required.

7.2.24 Critical fire panel commands for example: isolate, de-isolate, entered via the graphical user interface shall be able to accept bespoke alphanumeric input from the operator that will be stored with the event in the event history log.

7.2.25 The event banner shall be easily configured to suit the customers need to include alarm, fault, isolate, evacuate etc status and control as necessary.

7.2.26 Network cards will be flash upgradable for speedy updating of configuration software.

7.2.27 The network shall have the ability to connect to a BMS system, via Modbus, Profibus, BACnet and by OPC from the GUI.

networking and graphics

7.2.28 The network will support both previous generation and new generation systems on the same copper or fibre optic path.

7.2.29 Network cards will be flash upgradable for speedy updating of configuration software.

7.2.30 The network and GUI will be further developed to allow integration to 3rd party products using bespoke interfaces

documentation

8 Documentation

8.1 Tender Documentation

8.1.1 At the time of tendering, the Fire Alarm company shall fully and accurately describe the proposed fire detection and alarm system and its design concepts.

8.1.2 The Fire Alarm company shall provide a complete set of layout drawings and specifications describing all aspects of the system, including:

1. Detailed component and equipment list with model and manufacturers part numbers.
2. Product sheets for each item of equipment.
3. Theory of Operations with description of system functions.
4. Written confirmation that a manufacturer trained representative will:

a) Provide on-site supervision during system installation
b) Perform all final testing and commissioning of the installed system
c) Instruct operating personnel on all system operations.

8.1.3 The Fire Alarm company shall provide a schedule showing the times required to design, build, install, test and commission the system. The schedule shall also include any special requirements, such as additional training for operating personnel, etc.

8.2 Contract Documentation

8.2.1 The Fire Alarm company shall provide a complete set of documents describing the system and its design concepts, installation, final testing, commissioning, and required operating and maintenance procedures.

8.2.2 As a minimum, the following documentation shall be provided for the system:

1. System description.
2. Checklist of equipment and components.
3. Installation instructions.
4. Equipment connection diagrams showing wiring detail of Addressable Device positions with addresses.
5. Standby battery calculations showing system power requirements and formulas used to calculate specified power.
6. Final testing instructions.
7. Commissioning instructions.
8. Certification documents.
9. Log book
10 System operating instructions
11 Routine maintenance instructions and schedules.
12. Remote monitoring link description and operating instructions (if this option is being provided).

documentation

8.2.3 As a minimum, the following drawings shall be provided for the system:

1. System schematic diagram.
2. Cabling and wiring diagram.
3. Detailed equipment connection diagrams.
4. Building plan showing zoning and location of fire controller, detectors, call points, sounders and ancillary devices.

8.2.4 The Fire Alarm company shall provide a complete set of system operating and maintenance manuals for the following:

1. Fire controller
2. Detectors
3. Call points
4. Sounders
5. Ancillary devices
6. Remote monitoring link (if this option is being provided).

8.2.5 The date for submission of all documentation shall be in accordance with the schedule provided by the Fire Alarm company and as agreed with the client.

installation

9 Installation

9.1 General

9.1.1 Correct installation, combined with the use of high quality equipment, components and cabling, ensures that the fire detection and alarm system shall operate as designed and provide many years of trouble-free service.

9.1.2 The Fire Alarm company shall install the alarm system in accordance with the documented installation instructions.

9.1.3 The Fire Alarm company shall provide all relevant installation documentation required for each component of the system.

9.1.4 Installation of the system shall be in accordance with the recommendations set out in BS 5839–1 (Fire detection and fire alarm systems for buildings - Code of practice for system design, installation, commissioning and maintenance) and BS 7671 (Requirements for Electrical Installations - IEE Wiring Regulations, Seventeenth Edition).

9.1.5 The Fire Alarm company shall be responsible for the correct siting of all equipment and components of the system in accordance with previously agreed plans and drawings.

9.1.6 All cabling and wiring shall be tested before they are connected to the fire controller and its associated devices.

WARNING If the tests are carried out after the cables and wires have been connected to the controller and its devices, components within the controller and the devices will be damaged by high voltages used during testing.

9.2 Installation of Detectors

9.2.1 All detectors (and bases) shall be installed in accordance with guidelines set out in the national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/ TS 54-14, or ISO 7240-14 and the installation instructions provided by the manufacturer.

9.2.2 All detectors shall be installed in the exact locations specified in the design drawings; thus providing the best possible protection.

9.2.3 The type of detector installed in each particular location shall be the type specified in the design drawings.
9.2.4 All detector bases shall be securely fixed to BESA boxes and allow for easy fitting and removal of detectors.

For detectors fitted to a false ceiling a suitable adaptor shall be used to allow the assembly and installation of the detector and base to be completed and tested prior to the installation of the ceiling tile.

installation

9.2.5 Cable and wire entries to detector bases shall be fitted with grommets to prevent possible damage to the insulation.

9.2.6 Cable and wire strain relief clamps shall be provided at all entries to detector bases.

9.2.7 Cable entries of detector bases used in environments with abnormal atmospheric or operating conditions shall be appropriately sealed to prevent ingress of dust, water, moisture or other such contaminants. Use of the suitably I.P. rated back boxes, in such environments should be adopted.

9.2.8 Where detector bases are mounted to a false ceiling tile, the adaptor described in paragraph 4.15, should be used.

9.3 Installation of Control Devices

9.3.1 All control devices (e.g. call points, sounders, interface modules, etc.) shall be installed in accordance with the guidelines set out in the national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14 and the installation instructions provided by the manufacturer.

9.3.2 All control devices and associated modules shall be installed in the exact locations specified in the design drawings.

9.3.3 The type of control device installed in each particular location shall be the type specified in the design drawings.

9.3.4 All control devices and associated modules shall be securely fixed and, if required, marked with appropriate notices or warning signs as applicable.

9.3.5 Cable and wire entries to all control devices and associated modules shall be fitted with grommets or glands so as to prevent possible damage to the insulation.

9.3.6 Cable and wire strain relief clamps shall be provided at entries to control devices and associated modules as required.

9.3.7 Cable entries of control devices and associated modules used in environments with abnormal atmospheric or operating conditions shall be appropriately sealed to prevent ingress of dust, water, moisture or other such contaminants.

installation

9.4 Installation of Fire Controller Equipment

9.4.1 The fire controller equipment shall be installed in accordance with the guidelines set out in the national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14 and the installation instructions provided by the manufacturer.

9.4.2 The fire controller and its associated component parts shall be installed in the location specified in the design drawings.

9.4.3 The type of fire controller and its associated component parts installed shall be the type specified in the design drawings.

9.4.4 The fire controller equipment shall be securely fixed and, if required, marked

with appropriate notices or warning signs as applicable.

9.4.5 Cable and wire entries to the fire controller and associated devices shall be fitted with grommets or glands to prevent possible damage to the insulation.

9.4.6 Cable and wire strain relief clamps shall be provided at entries to fire controller and associated devices as required.

9.4.7 The fire alarm system mains power connections to the fire controller equipment shall be accordance with the guidelines set out in the relevant national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14 and the installation instructions provided by the manufacturer.

9.4.8 The fire alarm system mains power and isolating switch shall be installed in accordance with the national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14.

installation

9.4.9 Each circuit of the system shall be connected to the fire controller via associated fuse or circuit breaker devices located within the fire controller unit.

9.4.10 All cables from the fire controller equipment to the detection and alarm devices shall be clearly labelled as part of the fire detection and alarm system.

commissioning

10 Commissioning

10.1 General

10.1.1 Both the installation (see Section 7) and the commissioning activities shall be undertaken as a single continuous operation.

10.1.2 Upon completion of the installation activity, the Fire Alarm company shall Test, Start-up, Commission and Handover the system to the client.

10.1.3 The fire system shall have the capability of demonstrating and proving the job specific cause and effect requirements without the need to connect the field devices. This must be possible using the control and indicating equipment and a computer only. It must be possible to produce a log of the test procedure for inclusion in the hand over documentation, if required.

10.1.4 The Fire Alarm company shall make use of the following documents to record test results and details of commissioning tests:

- Cable Test Sheets
- Installation Check Report
- System Layout Drawing(s)
- System Schematic Diagram(s)

10.1.5 In addition, Point Description Sheets which are used to configure the text descriptions displayed at the controller must be returned to the Fire Alarm company 21 days prior to the date agreed for commencement of commissioning. Copies of Point Description Sheets are provided to the client upon receipt of the order for the fire system.

10.2 Testing and Start-up

10.2.1 The Fire Alarm company shall be responsible for inspecting and testing the complete system, including:

1. Detectors
2. Call Points
3. Sounders and Visual Alarm devices
4. Ancillary Devices
5. Fire Controller Equipment and Associated Devices
6. Auxiliary Equipment (e.g. Plant Interface Module, etc.)
7. Operating and Control Software.

10.2.2 The fire controller and associated devices and modules shall be tested in accordance with the guidelines set out in the national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14 and the testing instructions provided by the manufacturer.

commissioning

10.2.3 The Fire Alarm company shall start up and operate the system for a trial period to ensure that it operates correctly.

10.2.4 The Fire Alarm company shall test all functions of the system, including the software, to ensure that it operates in accordance with the requirements of the design specification and relevant standards.

10.2.5 The Fire Alarm company shall undertake audibility tests during which the sounders may be operated continuously over a period of two hours. (Should the client require these tests to be carried out at a separate visit, or out of normal working hours, this can be arranged at additional cost).

10.3 Commissioning

10.3.1 Commissioning of the system shall constitute practical completion.

10.3.2 Following the satisfactory completion of installation, testing and start up, the Fire Alarm company shall demonstrate to the client that the system successfully performs all of the functions set out in the design specification.

10.3.3 The Fire Alarm company shall provide the client with an agreed quantity of spare parts testing equipment and consumables which are to be used during routine maintenance and testing of the system.

10.3.4 The Fire Alarm company shall provide a client appointed fire system supervisor with on-site training in the use, operation and maintenance of the system and explain the procedures to be followed in the event of fire and false alarms. The system supervisor shall also be shown how to carry out routine maintenance and testing procedures, and how to keep the Log Book. (also see Section 9).

10.3.5 The Fire Alarm company shall prepare a report detailing all tests performed during installation and commissioning of the system. The report shall include the results of the tests and details of any specific settings or adjustments made. Any outstanding tasks or activities which are to be completed at another time shall also be included in the report.

10.3.6 The Fire Alarm company shall present an Acceptance Certificate for signature by the client.

10.4 Programming and Service Tool

10.4.1 Commissioning of the system shall be carried out using the Engineering Management Tool , which will communicate with the field devices using a 2way infra red wireless link.

10.4.2 The Engineering management Tool shall also permit direct connection to field devices such as manual call points and input/ output modules.

commissioning

10.4.3 The Engineering Management Tool shall be capable of storing the full system configuration.

10.4.4 The Engineering Management Tool shall allow the operator to write the device address and to test the device and its leds and control outputs.

10.4.5 The Engineering Management Tool shall guide the operator through the various commissioning modes to ensure full compliance with standards.

10.4.6 The Engineering Management Tool shall provide a full report of the system commissioning and testing process, on a USB stick, which can then be transferred to a pc , printed and e-mailed.

10.5 Handover

10.5.1 The Fire Alarm company, upon completion of the commissioning activity, shall hand over the system to the client.

10.5.2 At the time of hand over, the Fire Alarm company shall provide the client with the following documentation:

1. Copy of detailed report (see clause 8.3.5 above)
2. Component and equipment list
3. Product description sheets
4. System design specification
5. System design drawing(s)
6. System schematic diagram(s)
7. System operating and service manuals
8. Certificate of commissioning
9. Fire system users handbook, containing log book, routine maintenance instructions and schedules
10. Remote monitoring link description and operating instructions (if this option was provided).
11. Adequate User level training

training

11 Training

11.1 General

11.1.4 The Fire Alarm company and the client shall jointly agree the number of staff to attend the training courses.

11.2 System Supervisor Training

11.2.1 System supervisor training shall include technical training sessions provided at the Fire Alarm company's premises and/or on-site training given during installation and commissioning of the system.

11.2.2 System supervisor training shall be given by an experienced and competent engineer familiar with the fire system being installed.

11.2.3 The scope of training provided shall depend on the type, size and complexity of the system.

11.2.4 The Fire Alarm company shall initially provide technical training in all aspects of the system. The trainee shall then be given full instructions in the use, operation and maintenance of the system. This shall include instruction in the procedures to be followed in the event of fire and false alarms, routine maintenance and testing procedures, and how to keep the Log Book.

11.3 Other Staff Training

11.3.1 Other staff training shall include training sessions provided on-site after hand over of the system.

11.3.2 The training sessions shall be given by an experienced and competent engineer familiar with the fire system installed.

11.3.3 The scope of training provided shall include full operating instructions in the use of the fire system. This shall include instruction in the procedures to be followed in the event of fire and false alarms.

maintanence

12 Maintenance

12.1 General

12.1.1 Fire systems should be regularly maintained under a maintenance agreement in accordance with the national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14.

12.1.2 Fire and planning authorities, and in certain cases insurers, have powers to check that fire systems are maintained. Failure to maintain the fire detection and alarm system could contribute to death or injury in the event of fire.

12.1.3 The client shall be responsible for ensuring that daily, weekly and monthly routine maintenance is carried out in accordance with the recommendations set out in the national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14 and the service and maintenance instructions provided by the Fire Alarm company or manufacturer.

12.1.4 The Fire Alarm company shall provide detailed information about the maintenance services which can be provided after hand over of the system.

12.1.5 If requested, the Fire Alarm company shall prepare and submit a draft maintenance contract for consideration by the client.

12.1.6 The draft contract shall include complete details of all materials and labour required to maintain the system in correct working order. It shall also include details of the testing procedures which will be carried out and specify the proposed number of visits per year.

12.1.7 The Fire Alarm company shall be able to offer a 24 hour 365 day service call-out facility, with a maximum response time of 8 hours.

maintanence

12.2 System Spares

12.2.1 The Fire Alarm company shall provide a detailed list of the system spares which should be kept on-site for maintenance of the system.

12.2.2 Although the quantity of each item required is dependent upon the type and size of installation, the system spares which should be considered for inclusion in the list are as follows:

- Heat Detectors
- Smoke Detectors
- Flame Detectors
- CO Detectors
- Call Points
- Sounders and Visual alarm devices
- Beacons
- Door Retention Units
- Fuses
- Circuit Breakers

12.2.3 The draft maintenance contract shall also include details of the system spares which are be kept on-site for maintenance of the system.

12.2.4 The Fire Alarm company shall guarantee the availability of all system spares for a period of not less than ten years.

12.2.5 Detectors using the Carbon Monoxide channel, (electro chemical cell) should be tested, annually, and after 10 years replaced with new detectors.

12.3 System Test Equipment

12.3.1 The Fire Alarm company shall provide a detailed list of the system test equipment and consumables required on-site to maintain the system in perfect working order.

12.3.2 As the quantity of each item required is dependent upon the type and size of installation, the system test equipment and consumables which should be considered for inclusion in the list are as follows:

- Detector Head Removal Tool
- Call Point Testing Tool
- Detector Test Smoke Canister
- Detector Test Adaptor
- Aerosol Dispensing Tube
- Extension Tubes
- Spare Log Book

12.3.3 The draft maintenance contract shall also include details of the system test equipment and consumables which are to be kept on-site for routine maintenance and testing of the system.

12.3.4 The Fire Alarm company shall guarantee the availability of all system test equipment and consumables for a period of not less than ten years.

appendix

Appendix A

Short Form Specification – Key Points

Control & indicating Equipment

- The system shall allow the following functions to be carried out without the need for a computer, software or the attendance of an engineer.
    - change panel text
    - change zone text
    - change sector text (for networked systems)
    - change individual point text
    - add addressable devices
    - delete addressable devices
    - modify addressable devices
    - change individual point addresses

- The panel shall be capable of monitoring 250 addressable devices per loop and up to 240 zones.

On network systems where 2 or more panels exist , the system programming tool should allow zones to be freely allocated, panel by panel, and not be predetetermined. For example whilst zone 1 may be on panel 1 , zone 2 may be allocated to a different panel, by selection.

- The system shall have a clear, easy to understand LCD display with a minimum of 16 lines.

- High level access to the system shall be passcode protected.

Automatic Detectors

- The detection shall be capable of operating as a single address or a multiple address device.

- Detection shall have the ability to work as fire / smoke detectors and heat detectors simultaneously.

- Toxic gas detection approved to EN50291 shall be included.

- Remote LED indication shall be capable of responding to a single detector or a group of detectors.

- Hazardous area detection must be approved to ATEX for both gas and dust.

- Addressable aspirating detection shall be available.

appendix

Associated Ancillary Equipment

- Any door release equipment shall comply with the requirements of any national standard required in the country of installation, where such a standard exists, or where there is no country standard then to the European standard , CEN/TS 54-14, or ISO 7240-14.

- Loop powered fire alarm sounders shall be self monitoring.

- Loop powered sounder bases shall be capable of producing 100dB(A) at 1m.

- There shall be the ability to monitor any 4 to 20mA device directly from the addressable loop.

- The tone and volume of loop powered sounders shall be set at the control panel.

- The system must have the ability to provide wall and detector base mounted addressable beacons which can be easily seen where required.

Networking & Graphics

- The system shall be a true client server application which can communicate with panels over TCP/IP if required.

- The system shall be easy to reconfigure and modify.

- The system shall be capable of displaying text on one screen and graphics on another.

- The system shall be capable of interfacing with other services (i.e. CCTV).

- The network shall be capable of supporting 99 panels / graphic stations.

- The network shall be capable of operating over copper or fibre or a mixture of both.

- The network shall not rely upon a single network node.

Training

- Training must be available in the form of an interactive CD ROM.

Section two

An Introduction to the suite of EN54 standards

introduction

Overview

The Harmonisation of Standards for the design and manufacture of Fire Alarm and Detection Equipment.

Introduction

In 2013, after years of consultation, the EU Commission's proposal for a new Construction Products Regulation finally became effective. Unlike the Directive, which preceded the Regulation, member states cannot be selective as to which parts they adhere to. Proof of compliance with this regulation in respect of manufactured product is the CE marking.

Products for use as Fire Detection and Fire alarm systems are regulated by a set of standards referenced EN54. Standards that are in the process of being written are prefixed with the letters pr. Once written and agreed it becomes a harmonised standard, which under the EU Regulation applies in all EU member states and therefore has the status of being a national standard within that country. Annex ZA of each standard deals with the clauses of the standard in respect of their compliance with the mandate of the EU construction products directive, (now regulation).

All products built to EN54 standards are tested by independent third party organisations, of which there are several, across various member state countries. The testing of products is vigorous and comprehensive as will be seen from the individual standards. Approval whilst being mandatory within the EU also proves reliability and longevity as well as sensitivity which together are some of the most essential components of both life safety and property protection systems.

The aim of the following document is to provide an overview of each of the current harmonised standards, whilst not negating the need to consult, at times, both the full EN54 standard document together with other supporting documents, such as the ISO/IEC 6000 series of publications.

Foreword

These standards replace all previous versions and have the status of being national standards in all EU member states and therefore support the essential requirements of the EU regulations.

All devices should be clearly labelled with the manufacturers name or logo, part number, electrical connection detail and any further information which provides a means to identify the place and date of manufacture, batch and software versions. For detachable units both parts should be labelled. All labelling should use symbols or abbreviations which are in common use, otherwise such information should be explained in supporting documentation. The labelling should be permanent and clearly visible at all times.

introduction

Documentation shall be provided, prior to testing, which provides an aid to both installer, maintainer and user, giving a general description, detail of the device and which will support any compatibility assessment to be undertaken, as detailed in EN54-1, including power requirements, input/output ratings, transmission paths, battery capacities, current and internal resistance levels. Information relative to the connecting cables, environmental protection, and mounting and connection detail together with operating and maintenance instruction shall also be provided.

If on site adjustment of the device's response type is provided, the data shall clearly indicate the classification, means of adjustment or programming instructions.

Configuration data relevant to the compliance with a standard shall be stored in non-volatile memory and access shall be password protected or by use of a special tool and shall only be possible when the device is taken out of normal service.

EN54- description of Test Schedules

Operational performance, to prove that the specified sound levels can be achieved across the voltage range, and that the maximum sound level does not exceed 120 dB(A) at 1 m. (EN54-3)

Additional testing for voice sounders, to verify that the output level of the broadcast message in relation to that of the alert signal is sufficient. To verify the timing between the alert signal, the silence before and after the message and before the next alert signal, is within the limits set in table C1 of appendix C of EN54-3.

Durability, to show that the sound level does not change significantly after prolonged operation.

Operational performance and functional tests are to show the call point's ability to withstand small forces when applied to the frangible element and to operate correctly and only when an appropriate force is applied, all without damage to the test and reset functions which are also tested. (EN54-11)

Dry heat (operational), to establish the equipment functions correctly at high ambient temperatures for short periods **Dry heat (endurance)**, to establish the equipment can withstand long-term ageing effects.

Cold (operational), to establish the equipment functions correctly at low ambient temperatures

Damp heat, cyclic (operational), is to prove the immunity of the equipment where high relative humidity exists and where condensation may occur on the device.

introduction

Damp heat, cyclic/steady state (endurance), is to establish the equipment's ability to withstand the longer-term effects of high humidity and condensation.

Damp heat, steady state testing demonstrates the ability of the equipment to function at high relative humidity (without condensation), for short periods

Sulphur dioxide (SO2) corrosion (endurance), to establish the sounder can withstand the corrosive effect of sulphur dioxide as an atmospheric pollutant.

Shock (operational), is to establish the immunity of the equipment to infrequent mechanical shocks. **Impact test** is to demonstrate the immunity of the equipment to mechanical impacts.

Vibration, sinusoidal (operational), is to display the equipment's immunity to normal levels of vibration.

Vibration, sinusoidal (endurance), is to display the equipment's ability to withstand the long-term effects of vibration

Electromagnetic compatibility (EMC), immunity tests (operational), tests are carried out in accordance with EN50130-4 and include electrostatic discharge, radiated electromagnetic fields, induced effects from electromagnetic fields, fast transient bursts and slow high energy voltage surges.

Electromagnetic Compatibility (EMC), Immunity tests are designed to demonstrate immunity to electrostatic discharges caused by personnel, who may have become charged, touching the equipment or other adjacent equipment.

Electromagnetic Compatibility (EMC), is to show the manual call points ability to comply with the EMC immunity requirements in its normal service environment. (EN54-11)

Enclosure protection, to establish that the degree of protection provided by the enclosure of the fire alarm equipment, meets the minimum requirements for its type.

Repeatability, demonstrates a detectors stable sensitivity, during multiple alarms.

Directional dependence, to prove that performance is not dependent upon a specific airflow

Directional dependence, to demonstrate that the detector is sensitive to detecting radiation across its entire field of view (EN54-10)

Fire sensitivity, to prove that the detector has sufficient sensitivity to fire, and to determine a classification based on its detection range (EN54-10)

introduction

Reproducibity: to demonstrate that response times are within the specified limits and that the response times do not vary significantly during repeat testing.

Variation in supply parameters: to prove that within the equipment's specified voltage range the performance /response times are reasonably constant.

Air movement, is to demonstrate that the sensitivity of a detector does not significantly change in an air flow, and is not prone to false alarms in draughts or in short gusts.

Dazzling, is to demonstrate that the sensitivity of a detector does not significantly change when close to artificial light sources. (Applies only to optical detectors).

Fire sensitivity, is to demonstrate a detectors sensitivity to a broad spectrum of smoke types as required for general application in fire detection systems. (EN54-7)

Test Fires. The detectors shall be subjected to four test fires TF2 to TF5 (as detailed in Annexes G to J). The procedures are described for each test fire, along with the end of test condition and the required profile curve limits. The test fire numbers have been retained from EN 54-9. All detectors shall generate an alarm signal, in each test fire. (EN54-7).

Note: In the UK all EN standards are prefixed with BS, e.g. BS EN54-2

Note: all standards are referenced with a date and suffix to any amendments and corrigenda which have been issued since the original standard was published.

introduction

Foreword

This standard replaces all previous versions and has the status of being a national standard in all EU member states and therefore supports the essential requirements of the EU directive(s).

Introduction

The EN54 standard, part 1 explains the use of each part of the EN54 suite of standards. The standards apply to systems used for the early detection of fires in buildings, including providing warnings both locally and remote and operating other fire precautions, such as water or gaseous suppression systems. Consideration should be given if these standards are used for systems installed in other than building applications, as to their suitability.

Each standard covers the requirements, test and performance criteria, for measuring the reliability of the system component parts which together form the complete system. The tests are designed to prove their performance under varying conditions which they are likely to be subjected to during their lifetime.

Some standards listed below are published as harmonised standards. However some are relatively new and others are still in the process of preparation and some may not be EN54 standards.

CEN/TS 54-14 is an existing design standard which is currently being updated and will be an option in countries that do not have their own standards. An alternative published standard is ISO 7240-14 which offers similar design guidance. In countries that have their own national standard, e.g. in the UK BS5839, these will undoubtedly be the adopted standards.

Parts 16, 24 and 32 refer to voice alarm equipment which may form a separate and sub system to the fire alarm and detection system, but which when interconnected will effectively work as a complete system.

EN54-22 and 28 are draft standards covering line type heat detectors and resettable types.

Part 23 covers visual alarm devices which may be installed to compliment audible devices in noisy areas or to provide a warning to hearing impaired personnel.

Part 26, is in development and will cover point detectors using carbon monoxide sensors.
Part 27, is still in preparation and will detail the requirements for mounting smoke detectors into ducts.

Parts 29, 30 and 31 are all at varying stages of preparation and will, in time, cover multi sensor detection devices which may detect different fire

introduction

phenomena providing a wider spectrum of detection capability than a standard single channel device. The various detection channels of these devices can be combined in software to provide either more resilience or increased sensitivity dependent upon the risk and environment. Currently ISO 7240- 8 and 15 and CEA 4021 are all published documents covering some types of multi sensors.

Part 32- is at some stage of preparation and will form a guide to design, installation, commissioning, maintenance and use of voice alarm systems

Part 13 of the standard assesses the compatibility of components, which although individually approved to the relevant standard, have been assessed when working together as a system. This standard, whilst being the only published standard is not harmonised and is therefore not enforced under the Construction Product Regulation. It does however offer sound practical guidance to building networked systems.
Clause 4 of this Standard specifies both input and output functions associated with the fire detection and fire alarm system. Table A.1 (below), gives examples of products that fulfil these functions and references these to the applicable published standards

Annexes to EN54-1

A- Functions, examples and relevant standards, Clause 4 of this European Standard specifies functions and equipment of the fire detection and fire alarm system and associated systems. Table A.1 in Annex A gives examples of products that carry out the specified functions and gives information on relevant published standards applicable to these products and systems.

introduction

Table A.1 — Examples of products and systems carrying out the functions of FDAS and associated systems and applicable relevant standards

Reference	Functions	Example of product carrying the function	Relevant standards
A	Automatic fire detection function	Fire detectors such as:	
		Smoke detectors (point detectors)	EN54-7
		Line smoke detectors using optical beam	EN54-12
		Aspirating smoke detectors	EN54-20
		Duct smoke detectors	EN54-27
		Heat detectors (point detectors)	EN54-5
		Line type heat detectors)	EN54-22
		Line type heat detectors, non-resettable	EN54-28
		Flame detectors (point detectors)	EN54-10
		Carbon monoxide fire detectors (point detectors)	EN54-26
		Multi-sensor fire detectors:	
		Point detectors using a combination of smoke and heat sensors	EN54-29
		Point detectors using a combination of carbon monoxide and heat sensors	EN54-30
		Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors	EN 54-31
		Input device for auxiliary detection functions such as:	
		Sprinkler activated input	EN 54-18a
		Input device for connection of secondary detection circuit to a Primary detection circuit	

introduction

Table A.1 — Examples of products and systems carrying out the functions of FDAS and associated systems and applicable relevant standards

Reference	Functions	Example of product carrying the function	Relevant standards
B	Control and indication function	Control and indicating equipment (CIE), in conjunction with: Networked control and indicating equipment's Fire brigade panel	EN 54-2 EN 54-13
C	Fire alarm function	Voice alarm loudspeakers Fire alarm devices such as: Fire alarm sounders Visual alarms Tactile alarm devices	EN 54-24 EN 54-3 EN 54-23
D	Manual initiating function	Manual call points	EN 54-11
E	Fire alarm routing function	Fire alarm routing equipment (alarm transmission routing equipment)	EN 54-21
F	Fire alarm receiving function	Fire alarm receiving centre	EN 50518

introduction

Table A.1 — Examples of products and systems carrying out the functions of FDAS and associated systems and applicable relevant standards

Reference	Functions	Example of product carrying the function	Relevant standards
G	Control function for fire protection system or equipment	Output device to trigger fire protection equipment Output to fire protection equipment	EN 54-18[a] EN 54-2
H	Fire protection system or equipment	Duct mounted fire dampers Electrically controlled hold-open device for fire/smoke doors Smoke and heat control systems Fixed fire fighting systems: gas extinguishing systems Fire fighting systems: sprinkler or water spray systems Other fire protection measures	EN 15650 EN 14637 EN 12101 series EN 12094 series EN 12259 series
J	Fault warning receiving function	Fault warning routing equipment	EN54-21
K	Fault warning routing function	Fault warning receiving centre	EN50518

introduction

Table A.1 — Examples of products and systems carrying out the functions of FDAS and associated systems and applicable relevant standards

Reference	Functions	Example of product carrying the function	Relevant standards
L	Power supply function	Power supply equipment (PSE)	EN54-4
M	Control and indication function for alarm annunciation	Voice alarm control and indicating equipment (VACIE) Control for other fire evacuation measures	EN 54-16
N	Ancillary input or output function	Data communication interface	
O	Ancillary management function	Visualization system Building management system	
⟷	Exchange of information between functions	Short-circuit isolators Components using radio links Alarm transmission systems such as: series LAN/WAN PSTN GSM GPRS	EN 54-17 EN 54-25 EN 50136

[a] EN 54-18 does not include detailed functional requirements for the input/output devices but requires that their function is sufficiently specified by the manufacturer and that the CE attestation of conformity assesses that they function correctly in accordance with the manufacturer's specification

Part 2 control and indicating equipment

Introduction

The standard covers both mandatory and optional functionality with regards to the system control and indicator equipment. The "optional functions" allows for specific functions associated with requirements which may not be standard but still allows the products to comply. The options covered in annex B are those already used by some member states and have therefore been included in this standard and may also form part of their local national standard.

Requirements

The control and indicating equipment shall be capable of being in, and also displaying indication appropriate to, Fire, Fault, disablement, and where provided, test. The rules governing alphanumeric displays are also listed. An indication of external power shall be provided. Any other kind of indication may be displayed, however all indications must be clear and unambiguous.

Audible indication, indicating a change of state shall be provided within the control and indicating equipment and shall be capable of being silenced, but not automatically. The audible alarm should resound for each subsequent event.

A reset function shall be provided and be used for both fire and fault, with the current status of the system, including points not reset being displayed within 20 seconds.

Output of the fire alarm condition may be signalled to numerous devices, including audible alarms, visual alarms, transmission equipment and other fire protection systems, with at least one output being mandatory.

Time constraints are detailed in this section, being 10 seconds, if no delays are programmed. Delays and coincidence are recognised as being acceptable in some cases with delay timers being programmable up to a maximum of 10 mins. The rules relating to these functions are detailed within the standard. The equipment may include provision to record the number of fire alarm events.

Fault recognition and indication is covered in respect of the various categories of fault which could occur. These include faults within and external to the control and indication equipment. These are prioritised into three groups, faults in specified functions, power loss and system faults. The implications of each can be quite different. Faults shall be processed and their status indicated within 100 secs.

control and indicating equipment

In the event of a mains power loss, the equipment shall have the ability to recognise if the standby supply is capable of providing at least the mandatory system function, otherwise an audible indication shall be sounded for a period of at least 1 hour.

Disablements may be applied to inputs and outputs, such as zones, audible and visual devices and signal transmission paths. Such disablement should only affect those linked indications and outputs and not be global. Indications of disablements shall be provided both generally and for specific disablements.

Indication of a Test Condition shall be displayed whenever any part of the system is under test. Those parts of the system under test must be clearly displayed and all mandatory indications from those parts of the system not under test will still be provided. Tests must be started and ended manually. Outputs from those zones under test will not be triggered by the test.

The Input/output Interface is an approved method of communicating between the main control and indicator panel and a sub panel capable of performing functions associated with the cause and effect, such as operating a fire protection system or communicating with the fire brigade. The sub panel is not a part of the main control and indicator panel under this standard; however the minimum functional requirements regarding the interface are clearly detailed. Where the sub panel is a fire brigade panel and because requirements vary from country to country, the specified interface functions negate the need for the panel specification to be harmonised under this standard. Most panels will be approved locally.

Design Requirements for the control and indicator panel are listed in clause 12 of the standard. Not all panel functionality can be tested therefore manufacturers are required to confirm compliance in accordance with the standard by way of documentation. Both electrical and mechanical details are included in the standard as is the integrity of its transmission paths, the accessibility of indicators and controls, the specification for indicator lights, including colours, alphanumeric displays, and audible indications. The panel's software and software processing methods together with the means of storing both programmes and data are also detailed.

control and indicating equipment

The panel will be clearly labelled, including the ref to the standard, the manufacturers logo and model number.

Testing of the main control and indicator panel is carried out in a test environment with a specimen configuration loaded into the panel.

The test objectives are to prove the operation of the equipment and to enable this; a test schedule is drawn up prior to testing. Testing will prove the fire alarm, fault and disabled conditions. Environmental tests are carried out in accordance with table 1, below.

Table 1. Environmental tests

Test	Operational or endurance	Sub-clause number
Cold	Operational	15.4
Damp heat, steady state	Operational	15.5
Impact	Operational	15.6
Vibration, sinusoidal	Operational	15.7
Electromagnetic compatibility (EMC) immunity test	Operational	15.8
Supply voltage variations	Operational	15.13
Damp heat, steady state	Operational	15.14
Vibration, sinusoidal	Operational	15.15

control and indicating equipment

Table B.1 Optional functions

Option	See clause
Option	
Indications:	
Fault signals from points	8.3
Total loss of power supply	8.4
Alarm counter	7.13
Controls:	
Dependency on more than one alarm signal	7.12
Delays to outputs	7.11
Disablement of each address point	9.5
Test condition	10
Outputs:	
Fire alarm device(s)	7.8
Fire alarm routing equipment	7.9
Automatic fire protection equipment	7.10
Fault warning routing equipment	8.9
Standardized I/O interface	11

control and indicating equipment

Annexes to EN54-2

Annex A- Explanation of Access Levels, defines these for all mandatory functions detailed within the standard.

Annex B (informative) Optional functions with requirements and alternatives.
As described earlier this standard confirms those mandatory functions necessary to comply together with some optional functions which might also be provided. The optional functions described in this standard which have already been adopted by some countries are listed in table B1 below.

Annex C; refers to the processing of signals, where appropriate, from a fire detector to a point in the process where a decision is made.

Annex D; provides an explanation of the zones and their appropriate indications, together with the limitations regarding device loading.

Annex E; explains the process of delaying outputs when processing signals from both detectors and manual call points.

Annex F; covers the recognition and processes when dealing with faults.

Annex G; explains the requirements for the interfacing of the input/output equipment such as fire brigade panels.

Annex H; refers to the integrity of transmission paths to limit the effects caused by faults.

Annex I is specific to control and indication equipment which requires software.

Annex ZA; deals with the clauses of the standard in respect of their compliance with the mandate of the EU construction products directive, (now regulation).

part 3 fire alarm devices - sounders

Introduction

This standard covers the requirements for the construction and performance of sounders and their performance under climatic, mechanical and electrical interference conditions. Sounders are classified as indoor (A) and outdoor (B). In fire detection and fire alarm systems, voice sounders are also used for warning the occupants of a building of the outbreak of fire, using a combination of signal and voice message(s).The requirements, test methods and performance criteria specified in this standard for sounders are also applicable to voice sounders. Additional requirements specific to voice sounders are incorporated in Annex C.

Requirements

The sounder may produce different sound levels under different conditions, e.g., when operating on different voltage ranges or with different sound patterns. When appropriate the sound level of each unit may be measured for each sound pattern when tested. Alternatively the sounder will be tested using an output deemed to consume max current and produce the maximum sound output. The sounder shall produce A-weighted sound levels of at least 65 dB in one direction and not exceeding 120 dB in any direction.

(A- weighted sound level sound pressure expressed in dB, characteristics are given in IEC 60651).

Sounders can produce different frequencies and sound patterns and, therefore, this standard does not specify a minimum and maximum for either. These may also vary from country to country; therefore local standards need to be consulted. Access to the device shall be restricted by the use of special screws or tools and it should not be possible to change the manufacturer's settings without use of the same or by breaking a seal.

If on site adjustment of the device settings is provided, then the factory setting, which complies with this standard, should be clearly displayed for each and should only be accessible to change with a password or special tool.

Sounders shall be rated for a minimum of 100 hours which will not affect their ability to cycle on and off as required as part of the compliance testing. This requirement does not apply to the capacity of any integral batteries used as a means of providing local standby power. The capacity and charging requirements of such batteries should meet the requirement of the system.. The degree of protection provided by the enclosure of fire alarm sounders shall be in accordance with EN60529,

fire alarm devices - sounders

IP21 for type A and IP33 for type B. The attached labelling, will provide, reference to this standard, type A or B.

Voice Sounders are audible devices for generating and broadcasting recorded voice messages. The voice sounder shall meet all of the requirements applicable to audible fire alarm devices. To prevent acoustic interaction between adjacent voice sounders the provision for synchronising the alert signal and message sequence with that of other devices of the same type may be necessary. In this case, the requirements of the test described in appendix C shall be met.

Tests, are carried out to prove the sound levels specified by the manufacturer are achievable within the specified voltage range and do not deviate by more than 6dB for each direction. The maximum sound level must provide an output greater than 65dB (A) in at least one direction, and not exceed 120dB (A) in any direction, at 1 metre. Sound levels are required to be at the specified level for each of the angles specified by the manufacturer, through a semi -circular arc in front of the device).

fire alarm devices - sounders

Table 1 — Schedule of tests

Test	Subclause
Reproducibility	5.2
Operational performance	5.3
Durability	5.4
Dry heat (operational)	5.5
Dry heat (endurance)	5.6
Cold (operational)	5.7
Damp heat, cyclic (operational)	5.8
Damp heat, steady state (endurance)	5.9
Damp heat, cyclic (endurance)	5.10
SO2 corrosion (endurance)	5.11
Shock (operational)	5.12
Impact (operational)	5.13
Vibration (operational)	5.14
Vibration (endurance)	5.15

fire alarm devices - sounders

Table 1 — Schedule of tests

Test	Subclause
Electrostatic discharge (operational)	5.16
Radiated electromagnetic fields (operational)	5.16
Conducted disturbances induced by electromagnetic fields (operational)	5.16
Voltage transients, fast transient bursts (operational)	5.16
Voltage transients, slow high energy voltage surge (operational)	5.16
Enclosure protection	5.17

1) Where after one of the test specified in 5.5 to 5.16 the A-weighted sound level of the specimen being tested differs from that measured during the reproducibility test by more than 6 dB, a new specimen shall be used for the next test on the schedule for that specimen. The sound level shall be first measured as specified in 5.2.

2) The EMC tests specified in 5.16 are not required for sounders which do not rely on active electronic components for their operation.

3)The tests on an individual specimen may be carried out in any order except that the reproducibility test (5.2) shall be performed first on all specimens and the tests on specimens 1 and 2 shall be carried out in the order listed (i.e. 5.17 last).

fire alarm devices - sounders

Annexes to EN54-3

Annex A- Sound level test
Annex B- Comparative sound test
Annex C- Voice Sounders
Annex ZA; deals with the clauses of the standard in respect of their compliance with the mandate of the EU construction products directive, (now regulation).

part 4 power supply equipment

Introduction

This standard covers the requirements, test procedures and performance of power supplies used with fire alarm and detection systems in buildings, both internal and external to the control and indicating equipment.

General requirements

The requirements for meeting this standard are detailed in clauses 4-8 and testing is as detailed in clause 9 of this standard. The power supply unit will operate from an incoming mains supply and incorporate at least one rechargeable standby battery. The unit will be capable of maintaining a fully charged battery. Each source of power shall be capable of supplying the specified output or for an integral power supply, the equipment into which it is integrated.

The incoming mains supply should be solely for the fire detection and alarm system and its standby batteries. The battery should automatically supply the system in the event of an incoming power failure and revert to standby when the supply is restored. Failure of an integrated power supply incoming mains shall be transparent other than to operate any power warning indicators. Any known interruptions during changeover of power source shall be detailed by the manufacturer. Failure of one power source shall not render the unit inoperative such that no power is delivered to the system.

Functionality

The power supply shall be capable of delivering full power to the system irrespective of the standby battery condition, including when recharging a discharged standby battery. The standby battery charging current can be reduced when the power supply is required to supply maximum current to the system. The standby battery should also be capable of supplying the systems demands when the incoming mains supply is disconnected. The power supply shall be fully monitored, including incoming mains, battery supply, and battery high resistance. The power supply shall signal a fault condition within 30 minutes of the fault occurrence. If the power supply unit is an integral part of the control and indicating equipment such faults shall be signalled in accordance with EN54-2.

The design, electrical and mechanical, shall be in accordance with section 6 of the standard. If the power supply is designed for use with the control and indicating equipment but external to, then duplicate connections should be made ensuring that a single short circuit cannot result in a loss of power.

The standby battery will be suitably labelled indicating its age and type and if integral to other components of the fire alarm and detection system, shall be of the sealed type. The batteries output voltage should be monitored and outputs turned off if that voltage

power supply equipment

falls below the specified level.
The battery charger will charge the battery automatically and when discharged to its final voltage be recharged to 80% of its capacity within 48 hours. The charger shall be designed and operate within the battery manufacturers temperature limits.
Other than for monitoring purposes the battery shall not discharge through the charger,
when a potential difference exists.

If required to operate during the testing the power supply equipment shall be connected to both mains and a suitable battery. The output shall be connected to suitable cable and tested under a full load. Fully functional tests are as detailed in section 9 and carried out in accordance with table 1. However the procedure and requirements do vary between integrating and non-integrating power supply equipment.

power supply equipment

Table 1-Functional tests

Test	Mains supply voltage	Condition of battery	Loading condition	Duration of test
1	Vna + 10 %	Discharged b	I max. a	4h
2	Vn 15 %	Discharged b	I max. a	4h
3	Vn 15 %	Discharged b	I max. b	Manufacturer's specification with a minimum of 5 mins
4	Disconnected	Discharged c	I max. b	
5	Vn 15 %	Replaced by short circuit d	I max. a	
6	Vn 15 %	Replaced by short circuit e	I max. a	
7	Vn + 10 %	Disconnected	I max. b	
8	Vn 15 %	Disconnected	I max. b	
9	Vn + 10 %	Fully charged f	I min	

a Vn is nominal voltage of the public electricity supply or equivalent.
b A battery of max specified capacity discharged to its final voltage as described in 9.3.1.1. The battery is allowed to charge during the test.
c In this test the battery may be replaced by a laboratory power supply capable of supplying the required output current. The output voltage of the power supply shall be gradually reduced from the fully charged voltage of the battery to the voltage at which the PSE output(s) switch off as in 5.2.3.
d Mains shall be applied after having replaced the battery by a short circuit.
e Replace the battery by a short circuit after the mains is applied.
f A battery charged to its fully charged voltage

power supply equipment

Environmental tests are carried out in accordance with table 2 below. If the power supply unit is housed within other equipment for which there is a different standard, then testing in accordance with that standard shall apply. (e.g. EN54-2).

However functional tests, required by this standard, to be undertaken after environmental testing, shall also take place. If the power supply is housed separately or in an enclosure for which there is no standard then table 2 shall apply.

Table 2 — Environmental tests

Test	Operational or endurance	Sub-clause number
Cold	Operational	9.5
Damp heat, steady state	Operational	9.6
Impact	Operational	9.7
Vibration, sinusoidal	Operational	9.8
Electromagnetic compatibility (EMC) immunity test	Operational	9.9
Damp heat, steady state	Endurance	9.14
Vibration, sinusoidal	Endurance	9.15

power supply equipment

Annexes to EN54-4

Annex A- Laboratory procedure for testing compliance with the requirements of 5.2.1 and 5.4.c

Annex ZA- Deals with the clauses of the standard in respect of their compliance with the mandate of the EU construction products directive, (now regulation).

part 5 heat detectors - point detectors

Scope

This standard specifies the requirements for point type heat detectors. Typical application temperature is the temperature of the environment into which the detector is placed and which exists for most of the time in a none fire situation as detailed in table 1.Maximum application temperature is that which the detector may be subjected to for short periods of time, in a non-fire situation as detailed in table 1.

Static response temperature is that at which the detector would be in an alarm state if subjected to a vanishingly small rate of rise temperature, typically 0.2K min -1

Classification

Detectors shall conform to one or more of the following classes, as shown in the attached table, column 1, according to the requirements of the detailed tests.

Table 1 Detector Classification temperatures

Detector Class	Typical Application Temperature °C	Maximum Application Temperature °C	Minimum Static Response Temperature °C	Maximum Static Response Temperature °C
A1	25	50	54	65
A2	25	50	54	70
B	40	65	69	85
C	55	80	84	100
D	70	95	99	115
E	85	110	114	130
F	100	125	129	145
G	115	140	144	160

heat detectors - point detectors

Manufacturers may add the suffix S, (Static) or R, (Rate of Rise) to the detector data. Detectors which provide only a static response do not respond below their minimum response temperature irrespective of the rate of rise in temperature. Detectors incorporating a rate of rise characteristic will meet the response requirements shown in table 4, even when installed where temperatures are significantly lower than the typical application temperature.

Individual alarm indication shall be provided for class A1, A2, B, C or D detectors via a red visual indicator which shall be extinguished when the detector is reset. Where conditions other than fire are indicated these shall be clearly distinguishable other than when the detector is in service mode. For detachable detectors the indicator may be in the head or the base and should be visible at a distance of 6 metres directly below the detector in ambient light levels of up to 500 lux.

Classes E, F or G detectors shall contain either an integral red indicator or some other means of indicating its alarm state.

Monitoring of detachable detectors shall be provided by which removal of the detector from its base without some form of indication is not possible.

The manufacturer's settings should not be accessible to change without the need for a password, special tool or by the breaking or removal of a seal. If on site adjustment of the detectors response type is provided, then the factory setting, which complies with this standard, should be clearly displayed for each detector and should only be accessible to change with a password or special tool or by the removal of the detector from its base.

Any settings which are not compliant with this standard shall only be accessible by the same means and it should be clearly displayed, either on the detector or in data format, the detector does not comply with this standard. The adjustments may be carried out either at the detector or via the control and indicator equipment.

Configuration data relevant to the compliance with a standard shall be stored in non-volatile memory and access shall be password protected or by use of a special tool and shall only be possible when the device is taken out of normal service.

heat detectors - point detectors

Detectors are subjected to the following Test Schedules.

Directional dependence: to prove that performance is not dependent upon a specific airflow

Static response temperature: to confirm the detectors response to a slow rate of rise in temperature. Static type detectors may also be subjected to further testing to ensure they do not respond below their stated response temperature relative to their class.

Response times from typical application temperature: to prove the detectors response, (table 1) to a range of rate of rise air temperatures. The response times should lie between the upper and lower levels shown in table 4, relative to its class.

Variation in supply parameters: to prove that within the detectors specified voltage range the response times are reasonably constant

Reproducibity: to show that response times are within the specified limits and for resettable detectors that the response times do not vary significantly during repeat testing. Response times shall be as detailed in table 4, between the upper and lower levels.

Cold (operational): to prove the detector operates correctly in low temperature environments. The detectors, (resettable) response when subjected to a rise in temperature of 3 Kmin-1 shall not be less than 7min 13s. At a temperature rise of 20 Kmin-1 the response time shall not be less than 30s for Class A1 and 1min for other classes. For non- resettable detectors the response times shall be those shown in table 4, between the upper and lower times for the relevant class.

Dry heat (endurance): proves the performance of detectors in classes C, D, E, F and G when installed in high ambient temperatures. The tests are at temperatures indicated in table 1. The detectors, (resettable) response when subjected to a rise in temperature of 3 Kmin-1 shall not be less than 7min 13s. At a temperature rise of 20 Kmin-1 the response time shall not be less than 1min. For non- resettable detectors the response times shall be those shown in table 4.

heat detectors - point detectors

Damp heat, cyclic and steady: These tests prove the detectors ability to exist in humid conditions and where there may be condensation present, for short and long durations. The detectors shall remain fault free and their response (for resettable) when subjected to a rise in temperature of 3 Kmin-1 will not be less than 7min 13s. At a temperature rise of 20 Kmin-1 the response time shall not be less than 30s for Class A1 and 1min for other classes. For non- resettable detectors the response times shall be those shown in table 4

Corrosion (SO2) will demonstrate the detectors resistance to corrosive atmospheres. The detector should remain fault free and respond, (resettable) to a rise in temperature of 3 Kmin-1 within 7min 13s. At 20 Kmin-1 the response time shall not be less than 30s for Class A1 and 1min for other classes. For non- resettable detectors the response times shall be those shown in table 4,

Shock, Impact and Vibration: these tests are designed to prove the detectors immunity to mechanical shocks, impact and short and long term vibration. The shock test procedure is that described in the IEC document 60068-2-27. long term vibration tests are conducted in accordance with IEC document 60068-2-6. The detector should remain fault free and respond, (resettable) to a rise in temperature of 3 Kmin-1 within 7min 13s. At 20 Kmin-1 the response time shall not be less than 30s for Class A1 and 1min for other classes. For non- resettable detectors the response times shall be those shown in table 4,

Electromagnetic compatibility (EMC): tests are carried out in accordance with EN50130-4. The detector should respond, (resettable) to a rise in temperature of 3 Kmin-1 within 7min 13s. At 20 Kmin-1 the response time shall not be less than 30s for Class A1 and 1min for other classes. For non-resettable detectors the response times shall be those shown in table 4.

heat detectors - point detectors

Table 1 Detector Classification temperatures

Rate of rise of air temperature	Class A1 detectors			
	Lower limit of response		Upper limit of response time	
K min - 1	Min	S	Min	S
1	29	0	40	20
3	7	13	13	40
5	4	9	8	20
10	1	0	4	20
20		30	2	20
30		20	1	40

heat detectors - point detectors

Table 4 Response time limits

Rate of rise of air temperature	Class A2, B, C, D, E, F and G detectors			
	Lower limit of response		Upper limit of response time	
K min - 1	Min	S	Min	S
1	29	0	46	0
3	7	13	16	0
5	4	9	10	0
10	1	0	5	30
20		0	3	13
30		40	2	25

Response times from high ambient temperature: proves the detectors ability to perform correctly in a high temperature environment. The detectors response time should fall between those indicated below in table 5.

heat detectors - point detectors

Table 5 Response time limits for maximum application temperature

Detector class	Lower limit of response time at air temperature rise of			
	3K min-1		20K min-1	
	Min	S	Min	S
A1	1	20		12
All other	1	20		12

Detector class	Upper limit of response time at air temperature rise of			
	3K min-1		20K min-1	
	Min	S	Min	S
A1	13	40	2	20
All other	16		3	13

Annexes to EN54-5
Annex A - Heat tunnel for response time and response temperature measurements
Annex B - Information concerning the construction of the heat tunnel
Annex C - Derivation of upper and lower limits of response times
Annex D - Apparatus for impact test
Annex ZA - Clauses of this European Standard addressing essential requirements or other provisions of EU Directives (now regulation)

part 7 smoke detectors

Scope, the standard specifies the requirements, test methods and performance criteria for point type smoke detectors, both optical and ionisation, including smoke detectors with more than one sensor. Ionisation detectors are not permitted in certain countries therefore local codes should be consulted.

Requirements
Compliance, for the detector to meet the requirements of this clause shall be verified by visual inspection or engineering assessment, tested as described in clause 5 and, for detectors with more than one smoke sensor, shall meet the requirements of the tests detailed in Annex N.

Individual alarm indication shall be provided via a red visual indicator which shall be extinguished when the detector is reset. Where conditions other than fire are indicated these shall be clearly distinguishable other than when the detector is in service mode. For detachable detectors the indicator may be in the head or the base and should be visible at a distance of 6 metres directly below the detector in ambient light levels of up to 500 lux. Where there is a connection to remote indicators, control relays etc., failures of these connections shall not prevent the correct operation of the detector.

Monitoring of detachable detectors shall be provided by which removal of the detector from its base without some form of indication is not possible.

The manufacturer's settings should not be accessible to change without the need for a password, special tool or by the breaking or removal of a seal.

If on site adjustment of the detectors response type is provided, then the factory setting, which complies with this standard, should be clearly displayed for each detector and should only be accessible to change with a password or special tool or by the removal of the detector from its base.

Any settings which are not compliant with this standard shall only be accessible by the same means and it should be clearly displayed, either

smoke detectors

on the detector or in data format, the detector does not comply with this standard. The adjustments may be carried out either at the detector or via the control and indicator equipment.

The detector shall be designed to restrict the access of insects into its sensitive parts without restricting smoke entry. In order to achieve this it may be necessary to take other precautions against false alarms due to the entry of small insects.

The provision of "drift compensation" to counter the effects of a build-up of dirt in the detector shall not significantly reduce the detector's sensitivity to slowly developing fires. To verify this, an assessment of the detector's response to slow increases in smoke density shall be made. The detector shall meet the requirements of clause 4.8 if its response times falls within those specified.

Testing a detectors response with very slow increases in smoke density is impractical and therefore assessment is made of the detectors response by a combination of test and simulations together with analysis of the software. The detectors performance is measured against formulae designed to confirm a response within 100 seconds when the increase in smoke density is greater than one fourth of the detector threshold value multiplied by 1.6. This ensures the detectors response value does not increase by more than a factor of 1.6 before an alarm condition is reached. A detectors response should fall between a maximum sensitivity of 1.5% and a minimum of 6% obscuration per metre when tested.

smoke detectors

Table 1 — Schedule of tests

Test	Clause
Repeatability	5.2
Directional dependence	5.3
Reproducibility	5.4
Variation in supply parameters	5.5
Air movement	5.6
Dazzling [1)]	5.7
Dry heat (operational)	5.8
Cold (operational)	5.9
Damp heat, steady state (operational)	5.10
Damp heat, steady state (endurance)	5.11
Sulphur dioxide (SO2) corrosion (endurance)	5.12
Shock (operational)	5.13
Impact (operational)	5.14

smoke detectors

Test schedule

Test	Clause
Vibration, sinusoidal (operational)	5.15
Vibration, sinusoidal (endurance)	5.16
Electrostatic discharge (operational)	5.17
Radiated electromagnetic fields (operational)	5.17
Conducted disturbances induced by electromagnetic fields (operational)	5.17
Fast transient bursts (operational)	5.17
Slow high energy voltage surge (operational)	5.18
Fire sensitivity	

1) This test only applies to detectors using scattered or transmitted light.

smoke detectors

Annexes to EN54-7

Annex A - Smoke tunnel for response threshold value measurements
Annex B - Test aerosol for response threshold value measurements
Annex C - Smoke measuring instruments
Annex D - Apparatus for dazzling test
Annex E - Apparatus for impact test
Annex F - Fire test room
Annex G -Smouldering (pyrolysis) wood fire (TF2)
Annex H -Glowing smouldering cotton fire (TF3)
Annex I - Flaming plastics (polyurethane) fire (TF4)
Annex J - Flaming liquid (n-heptane) fire (TF5)
Annex K - Information concerning the construction of the smoke tunnel
Annex L - Information concerning the requirements for the response to slowly developing fires
Annex M - Information concerning the construction of the measuring ionization Chamber
Annex N - Additional requirements and test methods for smoke detectors with more than one smoke sensor
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation).

part 10 flame detectors

Scope

This European Standard specifies the requirements, test methods and performance criteria for point-type, resettable flame detectors that operate using radiation from a flame for use in fire detection systems.

Requirements

Compliance is for the detector to be verified by visual inspection or engineering assessment and successfully tested as described in clause 5. Detectors will be classified, when responding to fires within 30 secs as: Class 1, up to 25metres, Class, 2 up to 17 metres or Class 3, up to 12 metres. Below 12metres detectors will not be classified.

Individual alarm indication shall be provided via a red visual indicator which shall be extinguished when the detector is reset. Where conditions other than fire are indicated these shall be clearly distinguishable other than when the detector is in service mode. For detachable detectors the indicator may be in the head or the base. Where there is a connection to remote indicators, control relays etc., failures of these connections shall not prevent the correct operation of the detector.

Monitoring of detachable detectors shall be provided by which removal of the detector from its base without some form of indication is not possible.

The manufacturer's settings should not be accessible to change without the need for a password, special tool or by the breaking or removal of a seal and for each setting. For those settings which the manufacturer claims compliance with this standard, each shall have achieved a classification corresponding to that marked on the detector for that setting;

If on site adjustment of the detectors response type is provided, then the factory setting, which complies with this standard, should be clearly displayed for each detector and

flame detectors

should only be accessible to change with a password or special tool or by the removal of the detector from its base.

Any settings which are not compliant with this standard shall only be accessible by the same means and it should be clearly displayed, either on the detector or in data format, the detector does not comply with this standard. The adjustments may be carried out either at the detector or via the control and indicator equipment.

Technical data regarding both installation and maintenance should be provided with each detector or in the case of supporting documentation, document references should be provided. If on site adjustment of the detectors response type is provided, the data shall clearly indicate the classification, means of adjustment or programming instructions.

For detectors which are software control controlled then the documentation, design, and storage of programs and data will meet the requirements of 4.9.2, 4.9.3 and 4.9.4.

The Principle of testing is to measure the response point when exposing the detector to radiation from a suitable flame source and establishing the maximum distance at which the detector will reliably enter the alarm condition within a time of 30 s. The test apparatus shall be as described in annex A, B and C. When testing, the radiation source is modulated in accordance with the manufacturer's specification. Tests are conducted using methane, n-heptane, and methylated spirit.

flame detectors

Table 1 — Test Schedule

Test	Subclause
Reproducibility	5.2
Repeatability	5.3
Directional dependence	5.4
Fire sensitivity	5.5
Dazzling (operational)	5.6
Dry heat (operational)	5.7
Cold (operational)	5.8
Damp heat cyclic (operational)	5.9
Damp heat steady state (endurance)	5.10
Sulphur dioxide (SO2) corrosion (endurance)	5.11
Shock (operational)	5.12
Impact (operational)	5.13
Vibration, sinusoidal (operational)	5.14
Vibration, sinusoidal (endurance)	5.15

flame detectors

Table 1 — Test Schedule

Test	Subclause
Variation in supply parameters (operational)	5.16
Electrostatic discharge (operational)	5.17
Radiated electromagnetic fields (operational)	5.17
Conducted disturbances induced by electromagnetic fields (operational)	5.17
Fast transient bursts (operational)	5.17
Slow high energy voltage surge (operational)	5.17

Annexes to EN54-10
Annex A - Optical Bench Response test
Annex B - Methane Burner
Annex C - Test Fires
Annex D - Dazzle test
Annex E - Impact test apparatus
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation)

part 11 manual call points

Scope

This standard specifies the requirements and methods of test for both indoor and outdoor manual call points and includes the appearance and operation for both types A (single action) and B (dual action). It covers simple devices, those fitted with electronic components (e.g. resistors, diodes) and addressable units. This Standard does not cover manual call points for use as intrinsically safe or for in hazardous conditions, where such applications require further requirements or tests. The Colours of various parts of the call point shall be in accordance with 4.7.2.3

Compliance is for the manual call point which shall be verified by visual inspection or engineering assessment and successfully tested as described in clause 5.

Requirements

Each manual call point should be clearly labelled providing information regarding the relevant standard, type, and whether indoor or outdoor version.

The normal condition of the call point shall be recognizable by the appearance of the operating face as detailed in 4.7.which shall be flat and shall not be broken, deformed or displaced?

Change from the normal to the alarm condition, will be by the following methods

For type A manual call points, breaking and/or displacing the frangible element together with changing the appearance of the operating face.

For type B manual call points: as above plus manually activating the operating element.

It shall be possible to see that the operating element is in the activated position but not possible to activate it without breaking or displacing the frangible element [see 4.3.2 b)] or without the use of a special tool (see 4.6).

A transparent flap may be fitted over the call point to protect against accidental operation of a type A call point. If Individual alarm indication

manual call points

is provided it shall be positioned on the front of the call point, be red and shall be extinguished when the call point is reset. It shall be visible from a distance of 2 m directly in front of the manual call point in an ambient light intensity up to 500 lx. Where conditions other than fire are indicated these shall be clearly distinguishable other than when the call point is in service mode. The call point shall be marked with the appropriate symbols as detailed in paragraph 4.7.3.

The manual call point shall be reset after operation as follows:

a) for non-resettable frangible elements, by inserting a new element;
b) for resettable frangible elements, by resetting the frangible element.

Furthermore for type B manual call points, it shall only be possible to return it to its normal condition by means of a special tool.

The manual call point shall incorporate a test facility, which will require a special tool to simulate an alarm condition by activating the operating element, allowing the manual call point to be reset without breaking the frangible element. Operating the frangible element shall not cause injury to the operator.

For type B manual call points the actuation force of the operating element shall meet the requirements of EN 894-3:2000.

For manual call points which are software control controlled then the documentation, design, and storage of programs and data will meet the requirements of 4.8.2, 4.8.3 and 4.8.4.

The alarm signal shall respond to the required test, indicated at the supply and monitoring equipment (see 5.1.2) within 10 s after the operating element has been activated.

manual call points

Table 2 — Test Schedule

Test	Clause Number
Variation of supply parameters	5.6
Dry heat (operational)	5.7
Dry heat (endurance)	5.8
Cold (operational)	5.9
Damp heat, cyclic (operational)	5.10
Damp heat, cyclic (endurance)	5.11
Damp heat, steady state (endurance)	5.12
SO2 corrosion (endurance)	5.13
Shock (operational)	5.14
Impact (operational)	5.15
Vibration (operational)	5.16
Vibration (endurance)	5.17

manual call points

Table 2 — Test Schedule

Test	Clause Number
Electromagnetic compatibility (operational)[a]; i.e. a) electrostatic discharge b) radiated electromagnetic fields c) conducted disturbances induced by electromagnetic fields d) voltage transient, fast transient bursts e) voltage transient, slow high-energy voltage surge	5.18
Enclosure protection	5.19

[a] Test only for manual call points with active electronic components.

manual call points

Table 2 — Test Schedule

Test	Indoor use	Outdoor use
Variation of supply parameters	×	×
Dry heat (operational)		×
Dry heat (endurance)		×
Cold (operational)	×	×
Damp heat, cyclic (operational)	×	×
Damp heat, cyclic (endurance)		×
Damp heat, steady state (endurance)	×	×
SO2 corrosion (endurance)	×	×
Shock (operational)	×	×
Impact (operational)	×	×
Vibration (operational)	×	×
Vibration (endurance)	×	×

manual call points

Table 2 — Test Schedule

Test	Clause Number
Electromagnetic compatibility (operational)$_a$; i.e. a) electrostatic discharge b) radiated electromagnetic fields c) conducted disturbances induced by electromagnetic fields d) voltage transient, fast transient bursts e) voltage transient, slow high-energy voltage surge	×
Enclosure protection	×

Annexes to EN54-11
Annex A- Test apparatus (for operation)
Annex B - Test apparatus (for non-operation)
Annex C- Test apparatus for impact test
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation)

part 12 smoke detectors - line type

Scope

This European Standard specifies requirements, test methods and performance criteria for line type smoke detectors utilising the attenuation of an optical beam, for use in fire detection systems. The detector will consist of a transmitter and a receiver and may include reflector(s).

Requirements

Compliance, for the detector to meet the requirements of this clause, shall be verified by visual inspection or engineering assessment and successfully
tested as described in clause 5.

Individual alarm indication shall be provided via a red visual indicator which shall be extinguished when the detector
is reset.

The manufacturer's settings should not be accessible to change without the need for a password, special tool or by the breaking or removal of a seal.

If on site adjustment of the detectors response type is provided, then the factory setting, which complies with this standard, should be clearly displayed for each detector and should only be accessible to change with a password or special tool or by the removal of the detector from its base.

Any settings which are not compliant with this standard shall only be accessible by the same means and it should be clearly displayed, either on the detector or in data format, the detector does not comply with this standard. The adjustments may be carried out either at the detector or via the control and indicator equipment.

Monitoring of detachable detectors shall be provided by which removal of the detector from its base without some form of indication is not possible.

A fire alarm signal shall have priority over faults resulting from a rapid change in obscuration or by a result of the limit of compensation being reached.

smoke detectors - line type

Configuration data relevant to the compliance with a standard shall be stored in non-volatile memory and access shall be password protected or by use of a special tool and shall only be possible when the device is taken out of normal service.

The detectors shall be tested in accordance with the test schedule in Table 1 and include the following test which are applicable to linear) beam) type smoke detectors.

Directional dependence, whereby the detector is tested to show that small inaccuracies in alignment do not affect its performance.

Slow changes in attenuation whereby the detector is tested to ensure that it can detect a slowly smouldering fire despite any sensitivity compensation applied to counter the effects of contamination of the optical components.

Optical path length dependence, whereby the detector is tested to show that the response threshold does not change significantly over the stated minimum and maximum optical path length.

Tests are conducted ensuring its sensitivity to a broad spectrum of fires likely to be encountered in various types of buildings and applications.

smoke detectors - line type

Table 1 — Test Schedule

Test	Subclause
Reproducibility	5.2
Repeatability	5.3
Directional dependence	5.4
Variation of supply parameters	5.5
Rapid changes in obscuration	5.6
Slow changes in obscuration	5.7
Optical path length dependence	5.8
Fire sensitivity	5.9
Stray light	5.10
Dry heat (operational)	5.11
Cold (operational)	5.12
Damp heat, steady state (operational)	5.13
Damp heat, steady state (endurance)	5.14
Vibration (endurance)	5.15

smoke detectors - line type

Table 1 — Test Schedule

Test	Subclause
Electrostatic discharge (operational)	5.16
Radiated electromagnetic fields (operational)	5.16
Conducted disturbances induced by electromagnetic fields (operational)	5.16
Fast transient bursts (operational)	5.16
Slow high energy voltage surges (operational)	5.16
Sulphur dioxide SO2 corrosion (endurance)	5.17
Impact (operational)	5.18

Annexes to EN54-12

Annex A - Smoke test for response threshold value measurements
Annex B – Fire test room
Annex C – Smouldering pyrolysis wood fire TF2
Annex D – Glowing Smouldering Cotton TF3
Annex E – Flaming Plastic (polyurethane) fire TF4
Annex F – Flaming liquid (n-heptane) fire TF5
Annex G –Stray light test set up
Annex H - Glowing smouldering cotton fire (TF3)
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation)

part 13 compatibility assessment of system components

Scope

This document specifies the requirements for the compatibility and connectability of system components that comply with the requirements of EN 54 or with their specification in the absence of an EN 54 standard and includes system requirements only when these are necessary for compatibility assessment. It also specifies requirements for the integrity of the fire detection and fire alarm system when connected to other systems.

Requirements

Compliance with this standard requires the system design and compatibility of its components to meet the requirements of this clause. This shall be verified by assessment (5.1) with regard to the documentation (4.7), and shall be successfully tested (if necessary) as described in 5.2 to 5.5. System requirements can also be stated in national application guidelines / codes of practice. Suppliers of components must ensure that they meet the requirements of this document and the relevant part of EN 54 and also the requirements of the application guidelines of the countries where the components are intended to be used.

Networked systems

A fault in a single fire alarm control panel shall not affect other control units. A single fault on a transmission path connecting control panels shall not adversely affect the functionality of the network. Where more than a single fault results in control panels being disconnected it shall be clearly displayed which panels are affected. All faults shall be indicated. Where there is justification, e.g. a high life risk the standard suggests that at each control panel there be a facility to communicate with the fire brigade, should 2 simultaneous transmission faults occur, disconnecting a panel from the network and the main control panel.

A fire alarm condition shall be indicated on the main control panel within 20 s and a fault within 120s.

compatibility assessment of system components

The means provided for minimizing the effect of a fault on a transmission path shall complete the restoration within 300 s. The main control panel shall at least indicate general conditions as defined in EN 54-2.

At the main control panel it shall be possible to identify the panel from which the signal originated.

At the main panel, it may be possible to operate controls which are found on the individual panels, but only with the same affects. Any software that is used for networking shall conform to EN 54-2:1997, Clause 13.

Compatibility can be achieved if essential components (type 1) operate within the specified limits in the relevant part of EN54, whereas essential components not covered by an EN54 standard shall conform to EN54-1, clause 4 and meet the EMC immunity requirements of EN50130-4. For a non-essential component (type 2), such as a printer, to be connected, then such a device must in no way jeopardise the operation of the system.

Input and output devices for connection to a fire protection system are considered as type 1.

Assessment methods and tests

A theoretical analysis to assess the compatibility of components when interconnected will take place and the outcome will indicate whether a physical test is required. (Annex C provides an example). EMC testing will be carried out if thought necessary.

Functional test for compatibility

This test is to prove compliance of components in a specified configuration provided by the manufacturer and in accordance with the relevant EN54 part.

compatibility assessment of system components

Annexes to EN54-13

Annex A - Function of a Fire Detection and Alarm System
Annex B – Classification of component types 1 and 2
Annex C – Example methodology for theoretical assessment

part 16 voice alarm control and indicating equipment

Introduction

This standard covers the requirements for the construction and performance for voice alarm control and indicating equipment for use in fire detection and fire alarm systems where the audible signal is in the form of tone(s) and/or voice message(s). Those parts of the system concerning audibility and intelligibility, are not covered in this standard. Consideration should be given to the requirements of an overall system that may affect the design and which may be specified in another part of EN 54, in national legislation, codes and standards or in contractual documents.

Requirements

A voice alarm system, when forming part of the fire detection and fire alarm system provides an audible fire alarm signal. Such a system will require voice alarm control and indication in order to react to an incoming alarm and subsequently generate and broadcast a message. The two systems may share an integrated form of control or be separate. This standard being similar in structure to part 2 stipulates those functions that are mandatory, as well as those which are optional. As in part 2 the optional functions may be specific to certain applications

When the systems are truly integrated they may share common indications, manual controls and outputs (see Annex F); however a single fault affecting the control and indicator panel shall not affect the mandatory functions of the voice alarm system. The indications and manual control(s) of the voice alarm condition shall be clearly identifiable.

The system power supply equipment may be common to both systems but must comply with the requirements of EN 54-4.

The voice alarm control and indicator shall be capable of clearly displaying the following, a quiescent condition; voice alarm condition; fault warning condition and a disablement condition .The control shall be capable of displaying, on different alarm zones at the same time, a voice alarm condition; fault warning condition and a disablement condition.

voice alarm control and indicating equipment

Where specified, all mandatory indications shall be clearly identified and where alpha numeric displays provide additional information for different functional conditions these may be displayed at the same time. Information should be grouped and separated for each condition. A separate power on indicator shall be provided on each enclosure, where they exist. Where further indication is provided it shall be distinguishable and not override the primary indicators. A system normal display may be provided but must not conflict with the above. The voice alarm control shall be capable of receiving and processing alarm signals and generating the appropriate voice alarm outputs within 3s or on the expiry of any delay period.

Annex E provides additional information concerning the interface between the voice alarm and the fire alarm controllers. The voice alarm control shall provide a fault warning within 100 s of the occurrence of a fault, unless specified differently in this European Standard or in other parts of EN 54. The voice alarm control may have provision for at least one spare power amplifier which should replace the faulty equipment within 10 secs of the fault being detected. The spare should be supervised when not in use.

A common fault warning shall be provided if there is a condition relating to any short circuit or interruption in a voice alarm transmission path, including the microphone and loudspeakers, even where the fault does not affect the operation of loudspeakers; and to any fire alarm devices when used, and the failure of any power amplifier.

The mandatory indications and/or outputs shall not be corrupted by multiple alarm signals when received simultaneously, either automatically or manually. Where the voice and fire alarm systems are separate, failure of the transmission path between the two shall not result in any loss of control or change of state of the voice alarm, without indication being provided.

The audible alarm (message) may be delayed, up to a maximum of 10 minutes but may be over-ridden

voice alarm control and indicating equipment

manually. Delays can be turned on/off manually or automatically, with the applicable level of access and a separate and discreet indicator or display shall be visible when an alarm occurs when the delay is turned on. The display will be cancelled when the alarm message is broadcast. The system can be configured for phased warning broadcasts, which can be switched on and off with the applicable level of access.

Where the voice alarm condition has been triggered from the fire alarm control, the message broadcast may be silenced and reset from the same control panel; incomplete messages will be completed before being silenced. The silence function should be reversible and messages rebroadcast when required. Any parts of the system which

remain in alarm after rest shall be redisplayed within 20 secs.

In addition to the voice alarm outputs the control may have provision for the automatic transmission of fire signals to other devices such as beacons and tactile devices. It shall be possible to deactivate and reactivate these with the appropriate level of access, but not automatically.

The alarm broadcast may be manually activated, zone by zone, or in groups of zones with the appropriate access level. Manual activation will activate all mandatory inputs and outputs. Indication that a voice alarm condition exits in each zone shall be provided and may be via a led and/or LCD display. Fault and disablement conditions can be displayed in similar fashion.

The voice alarm control may be interfaced to external control device(s) such as those required by local regulations; such interfaces shall provide only limited access and the mandatory functions of the voice alarm control shall not be overridden. Any faults in the transmission path between the two shall not prevent the operation of the mandatory functions, and shall display a warning if such a fault occurs.
The external control devices should comply with available local codes, European Standards or national standards.

voice alarm control and indicating equipment

The voice alarm control may contain emergency microphones which shall have priority over all inputs, including pre-recorded messages. Access will be by an appropriate level. Where a pre-alarm tone precedes the activation of the microphone an adjacent indicator will display when the microphone becomes active.

When the emergency microphone is in use any audible indication that causes any interference shall be automatically muted. Where multiple microphones are provided they shall be configured via appropriate access level and only a single microphone can be in use at any one time. Pre-recorded messages shall be stored in non-volatile memory.
All mandatory Indicators shall be visible at 3 m distance for general indications and the supply of power and at 0, 8 m distance for others. If flashing indications are used, both the on and off periods shall be a minimum of 0,25 s, and the flash frequency shall be a minimum of 1 Hz for voice alarm indications and 0,2 Hz for fault indications.

If the same led's are used for the indication of faults and disablements, fault indications shall flash and disablement shall be steady. Mandatory indications on an alphanumeric display shall be legible for at least one hour following the display of a new indication of an alarm and 5 min for fault or disablement conditions, at 0,8 m distance, in ambient light of 5 lux to 500 lux. The colours of the general and specific led's shall be red for alarms, yellow for fault, and disablements and green for power. Where voice alarm automatic message status indicators are provided, it might be advantageous to differentiate between evacuation and alert message with red for emergency messages and yellow for alert messages.

voice alarm control and indicating equipment

Table 1 — Test schedule on voice alarm control equipment

Test	Subclause
Output power	16.4
Signal-to-noise ratio	16.5
Frequency response of Voice alarm control without microphone(s)	16.6
Frequency response of Voice alarm control with microphone(s)	16.7
Cold (operational)	16.8
Damp heat, steady state (operational) Operational 16.9	16.9
Damp heat, steady state (endurance)	16.10
Impact (operational)	16.11
Vibration, sinusoidal (operational)	16.12
Vibration, sinusoidal (endurance)	16.13
Supply voltage variation (operational)	16.14
Electromagnetic Compatibility (EMC), Immunity tests (operational)	16.15[a]

[a] Visible and audible indications of purely transitory nature are allowed during the application of the conditioning.

voice alarm control and indicating equipment

Annex to EN54-16

Annex A - Explanation of Access levels
Annex B – Optional functions
Annex C – Design Requirements for software controlled systems
Annex D – General Information
Annex E – Interface between Fire and Voice Alarm controls
Annex F – Common Indications, controls and outputs in combined systems
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation)

part 17 short circuit isolators

Introduction

The purpose of a short-circuit isolator is to limit the consequences of faults in fire alarm circuits, both loops and spurs. Sections of these circuits are separated by installing short circuit isolators at strategic locations, and where applicable in accordance with the national standard of the country of installation where such a standard exists, or where there is no country standard then to the European standard, CEN/TS54-14, or ISO 7240-14.

In addition the short circuit isolators should be installed in accordance with the system manufacturers design limitations to ensure that circuits are not overloaded such as to create volt drop which is also likely to cause similar problems and jeopardise the correct operation of components.

Scope

This standard specifies the requirements and methods of test for short circuit isolators, for use in fire detection and fire alarm systems. Compliance shall be verified by visual inspection or engineering assessment and successfully tested as described in clause 5. However, for short circuit isolators which are integrated into other devices already covered by an existing European Standard the environmental conditioning shall be performed in accordance with that EN.

short circuit isolators

Requirements

If the short-circuit isolator incorporates an integral status indicator then this shall not be red.

Where it provides protection to ancillary devices, failures of these connections shall not prevent the correct operation of the short circuit isolator. If the isolating device is detachable (i.e. it is attached to a mounting base), then a means shall be provided to detect the removal of the device from the base in order to give a fault signal. It shall not be possible to change the manufacturer's settings or provide for on-site adjustment of the short-circuit isolator without the use of a code or special tool. For each setting the short circuit isolator shall comply with the requirements of this European Standard.

The functional testing is to verify operation within the manufacturer's specification and to test each condition claimed to cause it to operate and at the maximum specified current. The isolator should open circuit when detecting a short circuit condition and /or excess current causing a volt drop below a level at which the devices will function correctly.

short circuit isolators

Table 1 — Test Schedule

Test	Subclause
Reproducibility	5.2
Variation in supply voltage	5.3
Dry heat (operational)	5.4
Cold (operational)	5.5
Damp heat, steady state (endurance)	5.6
Damp heat, steady state (endurance)	5.7
Sulphur dioxide (SO2) corrosion (endurance)	5.8
Shock (operational)	5.9
Impact (operational)	5.10
Vibration, sinusoidal (operational)	5.11
Vibration, sinusoidal (endurance)	5.12
Electrostatic discharge (operational)	5.13
Radiated electromagnetic fields (operational)	5.13

short circuit isolators

Table 1 — Test Schedule

Test	Subclause
Conducted disturbances induced by electromagnetic fields	5.13
Fast transient bursts (operational)	5.13
Slow high energy voltage surge (operational)	5.13

Annex to EN54-17
Annex A – Examples of testing procedure
Annex B – Impact Test
Annex ZA -- deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation)

part 18 input/output devices

Scope

This Standard specifies the requirements, test methods and performance criteria for input/output devices connected to a fire detection and fire alarm system, which may transmit and/or receive signals which are, necessary for the operation of the fire detection and fire alarm system and/or fire protection system.

An input/output device may be physically separate or its function may be integrated into another device. Control and indicating equipment and ancillary control and indicating equipment (e.g. repeater panels and fire brigade panels) are not covered by this Standard.

Compliance

In order to comply with this Standard, the input/output devices shall be verified by inspection and engineering assessment and shall be successfully tested as described in Clause 5. If the input/output device is detachable then a means shall be provided to detect the removal of the device from its base in order to give a fault signal.

Introduction

The term input/output devices cover a wide range of different types of devices whose applications are different. These may include, digital inputs, monitored inputs for voltage, together with relay outputs, voltage outputs or solid state drivers to switch external devices.

This Standard does not therefore include detailed functional requirements for the devices themselves but requires that their function is sufficiently specified by the manufacturer and that they function correctly in accordance with that specification.

Devices shall be supplied with sufficient data to ensure their correct installation and operation. This data shall include the parameters necessary to define the input and/or output functions (e.g. output voltage and current ratings, alarm and fault trip levels and logic levels).

For devices which rely on software control, these shall meet the requirements of 4.5.2, 4.5.3 and 4.5.4.

input/output devices

Table 1 — Test schedule for input/output devices

Test	Subclause
Performance and variation of supply parameters	5.2
Dry heat (operational)	5.3
Cold (operational)	5.4
Damp heat, cyclic (operational)	5.5
Damp heat, steady state (endurance)	5.6
SO2 corrosion (endurance)	5.7
Shock (operational)	5.8
Impact (operational)	5.9
Vibration (operational)	5.10
Vibration (endurance)	5.11
Electromagnetic Compatibility (EMC), immunity tests	5.12

input/output devices

Annex to EN54-18

Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation).

part 20 aspirating smoke detectors

Scope

This Standard specifies the requirements, test methods and performance criteria for aspirating smoke detectors for use in fire detection and fire alarm systems.

Aspirating smoke detectors are used for the protection of more special and specific risks.

There are some aspects of the detectors functionality therefore not covered by this standard.

An aspirating smoke detector is one in which air and aerosols are drawn through a sampling device and carried to one or more smoke sensing elements by an integral fan or pump.

To comply with this standard the detector shall meet the requirements of this clause, which shall be verified by inspection and engineering assessment, and, when successfully tested in accordance with those described in Clause 6.

Requirements

Individual alarm indication shall be provided outside of the detector via a red visual indicator which shall be extinguished when the detector is reset. Where conditions other than fire are indicated these shall be clearly distinguishable other than when the detector is in service mode.

The response of an aspirating smoke detector is dependent upon both the sensitivity settings of the smoke sensing element and the design of the sampling device; e.g. pipework and sampling points. In some detectors the smoke sensing sensitivity can be adjusted in order to suit the application and sampling device.

The manufacturer's settings should not be accessible to change without the need for a password, special tool or by the breaking or removal of a seal. The adjustments may be made at the detector or at the control and indicating equipment.

aspirating smoke detectors

Changing the sensitivity settings can affect the classification of the installed detector. If it is possible to reconfigure the detector such that it no longer complies with the standard, then this shall be clearly marked on the detector or in the associated data. The provision of "drift compensation" to counter the effects of a build-up of dirt in the detector, and /or the provision of algorithms to suit an environment shall not significantly reduce the detector's sensitivity to slowly developing fires.

The sampling pipes and fittings shall have adequate mechanical strength and temperature resistance in accordance with EN 61386-1 to at least Class 1131. Pipes which are not classified by the manufacturer of the detector shall either be tested, as part of the approval, or be supported by evidence that the requirements of this standard are met.

An airflow fault signal will be generated, within 300secs, when the flow is outside the manufacturer's operational limits. The airflow shall be monitored to detect leakage or obstruction of the sampling device or pipework sampling point(s). This time is additional to any delay between signalling the fault and its indication at the control panel and is to allow for spurious short term flow variations which would otherwise cause unwanted fault signals.

The power for the aspirating detector shall be supplied by a separate power supply complying with EN 54-4 which may be within the main control and indicating equipment.

Aspirating Smoke Detector systems are classified based upon the sensitivity setting as shown in the table below. The method used for determining the classification is likely to take into account the sizes and number of sampling points, their position along the sampling device/ pipe, the sensitivity of the detector and the sampling device/pipework arrangement and its length.

aspirating smoke detectors

Classification table for aspirating smoke detectors

Class	Description	Example application(s)
A	Aspirating smoke detector providing very high sensitivity	Very early detection: the detection of very dilute smoke for example entering air conditioning ducts to detect the extremely dilute concentrations of smoke that might emanate from equipment in the environmentally controlled area such as a clean room.
B	Aspirating smoke detector providing enhanced sensitivity	Early detection: for example special fire detection within or close to particularly valuable, vulnerable or critical items such as computer or electronic equipment cabinets.
C	Aspirating smoke detector providing normal sensitivity	Standard detection: general fire detection in normal rooms or spaces, giving, for example, at least an equivalent level of detection as a point or beam type smoke detection system.

The detectors shall be tested according to the test schedule in the following table.

aspirating smoke detectors

Test Schedule

Test	Clause
Repeatability	6.2
Reproducibility	6.3
Variation of supply voltage	6.4
Dry heat (operational)	6.5
Cold (operational)	6.6
Damp heat, Steady State (operational)	6.7
Damp heat, Steady State (endurance)	6.8
SO2 corrosion (endurance)	6.9
Shock (operational)	6.10
Impact (operational)	6.11
Vibration (operational)	6.12
Vibration (endurance)	6.13
Electromagnetic compatibility, Immunity tests	6.14
Fire sensitivity	6.15

aspirating smoke detectors

Fire test requirements for multi-class detectors

Detector Class	Combination of configurations	Configuration to be used	Test fires to be applied (see Annexes B to H)
A only	Config A	Config A	TF2A, TF3A, TF4, TF5A
B only	Config B	Config B	TF2B, TF3B, TF4, TF5B
B only	Config C	Config C	TF2, TF3, TF4, TF5
B & C	Config B = Config C	Config B/C	TF2B, TF3B, TF4, TF5B
B & C	Config B ≠ Config C	Config B Config C	TF2B, TF3B, TF5B TF2, TF3, TF4, TF5
A, B & C	Config A = Config B = Config C	Config A/B/C	TF2A, TF3A, TF4, TF5A
A, B & C	Config A = Config B ≠ Config C	Config A/B Config C	TF2A, TF3A, TF4, TF5A TF2, TF3, TF4, TF5
A, B & C	Config A ≠ Config B = Config C	Config A Config B/C	TF2A, TF3A, TF5A TF2B, TF3B, TF4, TF5B
A, B & C	Config A ≠ Config B ≠ Config C	Config A Config B Config C	TF2A, TF3A, TF5A TF2B, TF3B, TF5B TF2, TF3, TF4, TF5

"Config A" means the worst case configuration for the Class A testing;
"Config B" means the worst case configuration for the Class B testing;
"Config C" means the worst case configuration for the Class C testing;
"=" means that configurations are the same
(e.g. Config A = Config B means that the same configuration is used for the Class A testing as for the Class B testing);
"≠" means that configurations are different
(e.g. Config B ≠ Config C means that a different configuration is used for the Class B testing than for the Class C testing).

aspirating smoke detectors

Annex to EN54-20

Annex A – Response threshold values
Annex B – Test Fire TF2
Annex C - Test Fire TF2A and B
Annex C - Test Fire TF2A and B
Annex D - Test Fire TF3
Annex E - Test Fire TF3A and B
Annex F - Test Fire TF4
Annex G - Test Fire TF5
Annex H - Test Fire TF5A and B
Annex I – Fire test room
Annex J – Slow developing Fires
Annex K – Air Flow test
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation).

part 21 alarm transmission and fault warning routing equipment

Scope

This Standard specifies the requirements, test methods and performance criteria for fire alarm and fault routing transmission equipment for use with fire detection and fire alarm systems. If functions other than those specified in this Standard are provided, they shall not jeopardize the functionality required for compliance. Transmission equipment can be type 1 where a dedicated alarm path exists and type 2 for a digital communicator using the public switched telephone network, both in accordance with EN50136-1-1.

Requirements

The alarm transmission routing equipment shall be capable of receiving fire alarm signals from the Control and indicator panel and faults from the transmission network which together with acknowledgements from the alarm receiving centre will be transmitted to the control and indicator panel. It shall also be capable of transmitting fire alarm signals to the alarm receiving centre.
The fault warning routing equipment shall be capable of receiving fault warning signal from the control and indicator panel and from the transmission network and transmitting faults to both the control and indicator panel and the alarm receiving centre.

Indication of signals shall be provided at the transmission equipment, via led's, or at the control and indicator equipment for both the received acknowledgement signal from the alarm receiving centre as defined in EN 50136-2-1 and at least one common fault warning be used to indicate the following:

1) if the acknowledgement signal is not received at the routing equipment within 100 s for type 1 and 240 s for type 2 of the initiation of the transmitted fire alarm.

2) a failure within the routing equipment (e.g. power supply failure).

3) a failure within the alarm transmission network.

4) where the routing equipment and the fire alarm control panel are in separate enclosures and where a fault exists on the interconnection path, a fault signal shall be indicated locally and transmitted to the alarm receiving centre.

alarm transmission and fault warning routing equipment

The routing equipment enclosure shall be of robust construction, consistent with the recommended installation method and shall be a minimum of IP30 of EN 60529. All light emitting indicators shall be clearly labelled with the information being legible at 0, 8 m distance in an ambient light intensity from 100 lux to 500 lux. If flashing indications are used, the on off-periods shall be a minimum of 0, 25 s and the flash frequency not less than 0, 2 Hz for fault indications. The light-emitting indicators shall be yellow for fault and red for the indication of the acknowledgement. All terminals and fuses shall be clearly labelled.

If the processing and transmission of fire and fault signals is achieved in separate equipment then both can operate simultaneously. If the signals are combined in a single piece of equipment then the fire signal shall take priority. A fault in any transmission path between the routing equipment and the transmission network (as defined in EN 50136-1-1) shall not affect the routing equipment or any other transmission path.

The power supply for the transmission equipment shall be in accordance with EN54-4. If the power supply is within a separate enclosure then duplicate paths will be arranged so that failure in one does not isolate the transmission equipment. The change over from the primary to standby power supply shall not affect any indications other than those specifically associated with power supplies. Any provision for disconnecting or adjusting the power supply to the equipment will not be readily accessible, without the required access.

alarm transmission and fault warning routing equipment

Access shall be provided on the routing equipment, from level 1 (most accessible) to level 4 (least accessible). Manual controls and other functions shall be grouped on the appropriate access level, as specified in EN 54-2.

Environmental tests

Test	Clause number
Cold	10.4
Damp heat, steady state, (operational)	10.5
Impact	10.6
Vibration, sinusoidal, (operational)	10.7
Electromagnetic compatibility (EMC) immunity tests	10.8
Supply voltage variations	10.9
Damp heat, steady state, (endurance)	10.10
Vibration, sinusoidal, (endurance)	10.11

alarm transmission and fault warning routing equipment

Annex to EN54-21

Annex A – Performance requirements for type 1 and 2 systems
Annex B – Verification of performance requirements
Annex C – Design requirements for software
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation).

part 23 fire alarm devices – visual alarm devices

Introduction

This Standard specifies the requirements, test methods and performance criteria for visual alarm devices in a fire detection and alarm system which are intended to signal a warning of a fire.
It applies only to pulsing or flashing visual alarm devices, such as xenon or rotating beacons.

In order to comply devices shall meet the requirements of Clause 4, which shall be verified by visual inspection or engineering assessment and shall be successfully tested as described in Clause 5.

Requirements

The purpose of a visual fire alarm device is to warn persons within, or close to a building of the outbreak of a fire. This Standard allows manufacturers to specify devices in terms of the range at which the required illumination is met. Three categories are defined; for ceiling and wall mounted devices and an open category. The maximum range of the visual alarm device is tested by measuring its light output in the surrounding hemisphere. As the light output can vary over time a test is made to check that any variation is acceptable. This Standard gives common requirements for the construction as well as for their performance under varying conditions Devices are classified as Type A, indoor and Type B, outdoor. The degree of protection provided by the enclosure shall be IP21 for Type A and IP33 for type B, in accordance with EN 60529.

The device shall be rated for a minimum of 100 hours which will not affect its ability to cycle on and off as required as part of the compliance testing. This requirement does not apply to the capacity of any integral batteries used as a means of providing local standby power.

fire alarm devices – visual alarm devices

The capacity and charging requirements of such batteries should meet the requirement of the system.

Access to the device shall be restricted by the use of special screws or tools and it should not be possible to change the manufacturer's settings without use of the same or by breaking a seal. If on site adjustment of the device settings is provided, then the factory setting, which complies with this standard, should be clearly displayed for each. Any settings which are not compliant with this standard shall only be accessible by the same means and it should be clearly displayed, either on the device or in data format that the device does not comply with this standard. The adjustments may be carried out either at the device or via the control and indicator equipment.

Visual alarm devices shall meet the requirement for coverage as either a 'C', ceiling mounted, or 'W', wall mounted, or 'O', open class device.

Category C devices shall be further specified as C-x-y where: x is either 3, 6 or 9 and is the maximum ceiling mounting height in metres and y is the diameter, in metres, of the coverage. e.g. C-3-12 would represent a 12 metre diameter coverage when mounted at 3 metres Category W devices shall be further specified as W-x-y where x is the maximum wall mounting height in metres, with a minimum value of 2.4 m; and y is the width of a square room, in metres covered by the device. e.g. W-2,4-6 represents a device mounted at a height of 2.4m in a room measuring 6mx6m. For category O devices the coverage volume in which the required illumination is achieved shall be specified.

The visual alarm device shall produce either red or white light of at least 1 candela for 70 % of all measurement points and shall not exceed 500 cd for any measurement points. The flash rate shall be between 0.5 and 2 Hz measured at 10 % of the peak values of consecutive leading edges of the first pulse of each flash. The maximum on time, measured between the leading and trailing edge shall not exceed 0.2 s. The light temporal pattern and frequency of flashing may vary in different countries and therefore reference needs to be made to local regulations.

Flashing lights may require synchronization to prevent the possibility of a flash frequency/

fire alarm devices – visual alarm devices

temporal pattern; that could adversely affect some occupants inducing epileptic fits when multiple devices are within a field of view. In such cases, devices shall meet the requirements of the test described in 5.3.7.

Technical data regarding both installation and maintenance should be provided with each device or in supporting documentation.

fire alarm devices – visual alarm devices

Table 1 — Test schedule

Test	Clause
Reproducibility	5.1.7
Duration of operation	5.2.1
Enclosure protection	5.2.4
Coverage volume	5.3.1
Variation of light output	5.3.2
Synchronization (option with requirements)	5.3.7
Dry heat (operational)	5.4.1.1
Dry heat (endurance)	5.4.1.2
Cold (operational)	5.4.1.3
Damp heat, cyclic (operational)	5.4.2.1
Damp heat, steady state (endurance)	5.4.2.2
Damp heat, cyclic (endurance)	5.4.2.3
Shock (operational)	5.4.3.1

fire alarm devices – visual alarm devices

Table 1 — Test schedule

Test	Clause
Impact (operational)	5.4.3.2
Vibration (operational)	5.4.3.3
Vibration (endurance)	5.4.3.4
SO2 corrosion (endurance)	5.4.4
Electromagnetic compatibility (EMC), immunity (operational): • Electrostatic discharge • Radiated electromagnetic fields • Conducted disturbances induced by electromagnetic fields • Voltage transients fast transient bursts • Voltage transients slow high energy voltage surge	5.4.5[b]

[b] The EMC tests specified in 5.4.5 are not required for devices which do not rely on active electronic components for their operation.

[c] The tests on an individual specimen may be carried out in any order except that the reproducibility test (5.1.7) shall be performed first on all specimens and the tests on specimen 2 shall be carried out in the order listed, except for the enclosure protection test, 5.2.4, which shall be conducted last.

fire alarm devices – visual alarm devices

Annexes to EN54-23

Annex A – Measuring light distribution
Annex B – Comparative light output measurement
Annex C – Light test chamber
Annex D – Flammability test requirements
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction Product Directive (now Regulation).

part 24 components of voice alarm systems - loudspeakers

Introduction

This Standard specifies the requirements, test methods and performance criteria for voice alarm loudspeakers for use with fire detection and fire alarm systems .For compliance, voice alarm loudspeakers shall be verified by visual inspection or engineering assessment and shall be successfully tested as described in Clause 5.

The purpose of a voice alarm loudspeaker is to provide intelligible warning to person(s) of a fire, whilst at the same time advising appropriate methods of evacuation. Providing such information speeds up a person's response time to an incident, removes uncertainty, allowing evacuation times to be reduced. Voice alarm loudspeakers need to achieve a minimum acoustical performance, as well as constructional and environmental requirements, to be suitable for use in fire detection and fire alarm systems.

Requirements

This standard recognizes that the performance of voice alarm loudspeakers will vary according to the nature of the space into which they are installed. It therefore specifies the minimum requirements and a common method for testing their operational performance against parameters specified by the manufacturer.

As the types of loudspeaker included are electromechanical devices without sensitive electronics, electromagnetic compatibility (EMC) tests are excluded. Loudspeakers are suitable for either indoor, type A or outdoor, type B, applications as specified. Type B loudspeakers can be beneficial in some indoor situations where high temperature and/or humidity are present. For type A the degree of protection required is to IP21 and for type B, IP33 of EN 60529.

components of voice alarm systems - loudspeakers

Loudspeakers suitable for special applications or hazardous areas are not covered by this standard.

The voice alarm loudspeaker shall be rated for a minimum of 100 hours operation at the rated noise power specified by the manufacturer. Access to the device will be limited and require special tools, codes, or be restricted by the use of hidden screws or seals.

Voice alarm loudspeakers shall be clearly marked and in addition to the standard data, detailed in the overview shall contain information relative to the rated noise voltage for transformer-coupled loudspeakers; the rated impedance for direct-coupled loudspeakers; the rated noise power at the highest power setting; and the various power settings (e.g. transformer tapping options for transformer-coupled loudspeakers).

Some loudspeakers are a combination of one or more housings together with a termination box and an interconnecting cable. The housing(s), cable(s) and terminal box should be considered to be 'the loudspeaker' for the purposes of this Standard. Examples include: pendant types and those with adjustable orientation such as horn or column loudspeakers and loudspeaker arrays.

The maximum sound pressure level is expressed in dB and measured at a distance of 4 metres from the reference point on the reference axis over a period of at least 30s. The loudspeaker shall be deemed to conform to the rated sound pressure test if the sound pressure level is greater or equal to the value specified by the manufacturer.

The loudspeakers shall be constructed using materials capable of withstanding the tests detailed in clause 5.

Plastic materials shall conform to EN60695-11-10 when operating on a voltage ≤ 30V RMS or 42.4 V dc with less than 15 watts of power, or, EN 60695-11-20 when operating on a voltage ≥ 30V RMS or 42.4 V dc with less than 15 watts of power.

components of voice alarm systems - loudspeakers

Table 1 — Schedule of tests

Test c	Subclause
Reproducibility (frequency response / sensitivity)	5.2
Rated impedance	5.3
Horizontal and vertical coverage angles	5.4
Maximum sound pressure level	5.5
Rated noise power (durability)	5.6
Dry heat (operational)	5.7
Dry heat (endurance)	5.8
Cold (operational)	5.9
Damp heat, cyclic (operational)	5.10
Damp heat, steady state (endurance)	5.11
Damp heat, cyclic (endurance)	5.12
SO2 corrosion (endurance)	5.13
Shock (operational)	5.14

components of voice alarm systems - loudspeakers

Table 1 — Schedule of tests

Test c	Subclause
Impact (operational)	5.15
Vibration, sinusoidal (operational)	5.16
Vibration, sinusoidal (endurance) 5.17 7	5.17
Enclosure protection	5.18

components of voice alarm systems - loudspeakers

Annexes to EN54-24

Annex A – Acoustical Measurements
Annex B – Rated noise power
Annex C – Physical references
Annex ZA; deals with the clauses of the standard in respect of their compliance with the mandate of the EU construction products directive, (now regulation).

part 25 components using radio links

Introduction

The purpose of this Standard is to define additional requirements to other parts of EN 54 that allow compliant radio fire detection systems and components to be at least as efficient and stable as approved wired fire detection systems. Systems and components are covered because it is difficult to describe the components separately. Limitations with respect to the use of radio components may be specified in national technical rules or guidelines and consideration should be given to the frequencies, bands and channels used by radio based systems. The requirements in this standard shall apply together with those in other parts of EN54 where the component has the same function as that covered in the other standard, and when not specifically covered in this standard. e.g. A heat detector installed on a wireless system will comply with EN54-5

Scope

This Standard specifies the requirements, test methods and performance criteria for both systems and components used in fire alarms systems which use radio frequency links to communicate. Compliance with this standard requires the components to meet these requirements which shall be verified by visual inspection or engineering assessment, and successfully tested as described in Clause 8.

Where combined wired and radio systems are used the relevant part of EN54 together with this standard will both apply. The requirements for wired systems are superseded or modified by this standard. This document does not cover those issues which relate to national regulations which may vary from country to country, and which may include frequencies, power and limitations of losses on circuits or radio links.

components using radio links

Requirements

The manufacturer shall provide a safeguard to ensure any attenuation, which may be caused by differing influences on site, does not affect the radio link in such a way as to prevent communication between components. The limits will be at least 10dB for frequencies up to 10MHz and as defined in Annex B for frequencies greater than 10MHz. The system shall use a secure transmission protocol which ensures that signals are not lost. Each component will be marked individually as an indication that they belong to the same system and components belonging to different systems should not be compatible.

The system should demonstrate immunity to its own radio influences and others on the spectrum. Those produced as a result of electromagnetic affects are covered by those guidelines in EN50130-4. Influences as a result of a direct attack is not covered or required in the EN54 standards. Where two or similar systems from the same manufacturer are operating within range it shall be ensured that they do not affect each other.

The manufacturer shall also ensure that signal transmission is possible, without causing interference, even if other users are working in the same band. Interference to a single receiver shall not cause alarm or fault messages at the control equipment. If any radio linked component is unable to transmit a message to the CIE within EN 54-2 defined periods it shall be indicated in less than 100 s.

Power supplied to the components shall be via a primary battery or an external power supply unit complying with EN54-4. Components powered by the independent power source shall be contained within the same enclosure. The battery shall have a minimum life of 3 years. The system requirements shall not cause the battery to discharge below 85% by end of life. The remaining 15 % of the rated capacity takes account of self-discharge of the power source.

All components powered from the independent power source shall be capable of transmitting a fault signal (low power) before the power source fails whilst still functioning.

components using radio links

Annexes to EN54-25
Annex A – Radio frequency shielded test
Annex B – Immunity to attenuation
Annex C - Autonomous power supply
Annex ZA; deals with the clauses of the standard in respect of their compliance with the mandate of the EU construction products directive, (now regulation).

electrical apparatus for potentially explosive atmospheres Intrinsic safety 'I'

BS EN 50020

Scope

This European standard was approved by CENELEC whose members are bound to comply. This gives this standard, with conditions, the status of a national standard.

The Standard specifies the construction and testing of intrinsically safe circuits, apparatus and associated apparatus for use in potentially explosive atmospheres. It applies to electrical apparatus in circuits which are safe and incapable of causing an explosion. The standard also applies to apparatus located outside the potentially hazardous area, or which are protected by another type of protection listed in EN 50014, where the intrinsic safety of the circuit may depend upon the apparatus itself.

Where intrinsically safe apparatus is required to be Category 1 G in accordance with EN 50284 it must also comply with the requirements in this standard. Where it is required to be Category M1 equipment in accordance with EN 50303 it must also comply with the requirements of this standard.

Note: EN 54 ceases to have harmonised status under the ATEX directive and was replaced by EN 60079-0.
(Equipment in Explosive atmospheres).
EN 50284 Equipment for use in Group II category 1G (general)
EN50303 Equipment for use in Group I category M1 (mining)

Requirements
The requirements of this standard apply to both levels of Intrinsically safe apparatus protection "ia" and "ib,
unless otherwise stated, and In the determination of the level, failure of components and connections shall be considered in accordance with 7.6.

When the maximum voltage is applied to the intrinsically safe circuits and apparatus of level "ia", it shall not be capable of causing ignition in normal operation when up to two countable and a number of none countable faults, which present the most difficult conditions, are present.

When the maximum voltage is applied to the intrinsically safe circuits and apparatus of level "ib", it shall not be capable of causing ignition in normal operation when up to one countable and a number of

electrical apparatus for potentially explosive atmospheres Intrinsic safety 'I'

none countable faults, which present the most difficult conditions, are present.

(Note: non countable faults are those in non-conforming components of the apparatus known as the associated apparatus; countable faults are those in components which conform to the constructional requirement of this standard, known as intrinsically safe apparatus. The application for ia covers all zones whereas ib devices are only approved for use in zone 1 and 2.

Simple apparatus can be defined as being a passive component such as a switch, or one where sources of stored energy are within defined parameters, for example capacitors, or where components can only generate very low levels of energy, which is also within the defined parameters, for example photocells. When simple apparatus is located in the hazardous area, it shall be temperature classified.

Where simple apparatus is to be located in a Category 1 G or M1, then the apparatus shall also comply with the requirements of EN 50284 or EN 50303 as applicable.

Temperature classification, (T1-6) defines the maximum surface temperature of any surface exposed to the atmosphere and ensures it remains below the ignition temperature.

Intrinsically safe and associated apparatus require an adequate enclosure so as to secure the method of protection, which for Group II is IP20 in normally benign environments and for Group I is IP 54, in accordance with EN 60529, (degree of protection provided by enclosures).

The maximum current in any insulated cable shall not exceed that specified by the manufacturer.

Terminals for intrinsically safe circuits shall be separated from non-intrinsically safe circuits including where intrinsic safety can be impaired by disconnected external wiring coming into contact with conductors or components. Terminals should be suitably arranged that components will not be damaged when connections are made and where separation is achieved by distance then the clearance between terminals shall ensure any bare conducting parts are at least 50mm apart and unlikely to come into contact, even if dislodged.

electrical apparatus for potentially explosive atmospheres Intrinsic safety 'I'

When separation is accomplished by locating terminals for intrinsically safe and non-intrinsically safe circuits in separate enclosures by use a partition and a single cover, the partitions separating terminals shall extend to within 1,5 mm of the enclosure walls, or shall provide a minimum distance of 50 mm between the bare conducting parts of the external conductors. Metal partitions shall be earthed and have sufficient strength and rigidity to prevent any damage during the connection of field wiring. The clearance between the terminals of separate intrinsically safe circuits is given in Table 4 of the standard. In addition, the clearances between the bare conducting parts of connected external conductors shall be at least 6 mm and between any conducting parts of external conductors and earthed metal shall be 3 mm.

Plugs and sockets used for connection of external intrinsically safe circuits shall be separate from and non-interchangeable with those for non-intrinsically safe circuits.

Protection shall be provided within intrinsically safe apparatus to prevent the reversal of the polarity of supplies including within a battery where this could occur. For this purpose, a single diode shall be acceptable.

Where a relay coil is connected to an intrinsically safe circuit, the contacts in normal operation shall not exceed their manufacturer's rating and shall not switch more than 5 A. or 250 V or100 VA. When the values exceed these but do not exceed 10 A or 500 VA, the values in Table 4 for the relevant voltage shall be doubled. For higher values, all circuits shall be connected to the same relay only if they are separated by a suitable earthed metal or insulating barrier. Where a relay has some contacts in intrinsically safe and others in non-intrinsically safe circuits, the contacts shall be separated by an insulating or earthed metal barrier in addition to Table 4. The relay shall be designed such that a broken or damaged contact cannot impair the integrity of the separation.

electrical apparatus for potentially explosive atmospheres Intrinsic safety 'I'

Where earthing of enclosures and equipment is required to maintain the type of protection (ia or ib), the cross-sectional area of any conductors, connectors and terminals used shall be rated to carry the maximum possible continuous current under the conditions specified in clause 5. Components shall also conform to clause 7.Where a connector carries a conductor such as an earth connection on which intrinsic safety depends, the connector shall incorporate at least three independent connecting elements for "ia" circuits and two for "ib" circuits and be rated to carry the maximum possible current.

Where a casting compound is used to exclude a potentially explosive atmosphere from components and intrinsically safe circuits, it shall conform to 6.4.4, and where used to reduce the ignition capability of hot components its profile shall reduce the maximum surface temperature of the casting compound to the desired value.

In both normal operation and fault conditions, any remaining components on which the type of protection depends, shall not operate at more than two-thirds of their rating. These maximum rated values shall be the normal commercial ratings specified by the manufacturer of the component.
Connectors shall be designed such that interchangeability with others in the same apparatus is impossible unless it does not result in an unsafe condition or the connectors are easily identified.

Where an explosion could adversely affect intrinsic safety, the use of cells and batteries, capable of exploding, under certain conditions must be confirmed as being safe for use in intrinsically safe and associated apparatus for both ia and ib applications. They shall be of a type where leakage onto components is not possible and preferably should be sealed. Batteries which are not sealed shall be tested in accordance with 10.9.2

electrical apparatus for potentially explosive atmospheres Intrinsic safety 'I'

The diodes and resistors within a safety barrier limit the voltage and current applied to an intrinsically safe circuit. These assemblies are used as interfaces between intrinsically safe and non-intrinsically safe circuits, and shall be subjected to the routine test of 11.1. The requirements of Table 4 shall also apply except that lines 5, 6 and 7 do not apply to opto-coupled barriers; e.g. galvanic isolators. In addition to any connection which may be at earth potential, the diode type barrier shall have a connection to earth through a 4mm(min) insulated wire.

Intrinsically safe and associated apparatus shall be marked in accordance with EN 50014.

For associated apparatus, the symbol EEx ia or EEx ib shall be enclosed in square brackets.

Connection facilities including terminal boxes, plugs and sockets shall be clearly marked and identifiableand where colour coded, it shall be light blue.

The documentation required by 23.2 of EN 50014 shall include the electrical parameters for the apparatus, power sources: output data; power receivers: input data, any special requirements for installation and use; the maximum voltage (ac/dc) which may be applied to non-intrinsically safe circuits or associated apparatus; special conditions relating to the type of protection, conformance or otherwise with insulation values (6.4.12); the designation of the surfaces of any enclosure where relevant to intrinsic safety and the environment for which the apparatus is suitable.

electrical apparatus for potentially explosive atmospheres Intrinsic safety 'I'

Appendix to EN50200
Annex A – Assessment of intrinsically safe circuits
Annex B – Spark test equipment
Annex C – Measurement of creepage, clearances and separation distances
Annex D – Encapsulation
Annex E – Certification for torches

fixed firefighting systems - components for gas extinguishing systems

EN 12094-1, Requirements and test methods for electrical automatic control and delay devices

Scope

This Standard specifies the requirements and test methods for electrical automatic control and delay devices (device) for use with automatic fire detection and fire alarm systems and CO2-, Inert Gas- or Halocarbon Gas-Fire Extinguishing Systems. The standard specifies both compulsory and optional functions. Additional functions associated with fire extinguishing can be provided, but are not covered by this standard.

Requirements

The electric auto control and delay may be an independent unit or an integral part of a control and indicator panel. If the devices are integral to a control panel and use the same indication and controls as that as the fire detection and alarm system then the requirements for this standard and EN54-2 shall both be fulfilled. The power supply requirements shall be in accordance with EN54-4 and there shall be duplicate paths between the two if the power supply is not integral to the automatic control and delay device.

The functionality of the device shall be in accordance with clauses 4, 5, 6 and 9.3 of this standard. Testing is as detailed in section 9.

The device shall be classified for one of the following based upon the intended ambient conditions:

Class A: temperature range of - 5 °C to + 40 °C;
Class B: temperature range of – 20 °C to + 50 °C;
Class C: temperature range of - 5 °C to + 40 °C and corrosive atmosphere class 3C4 of EN 60721-3-3;
Class D: temperature range of - 20 °C to + 50 °C and corrosive atmosphere class 3C4 of EN 60721-3-3.

fixed firefighting systems - components for gas extinguishing systems

The device shall receive and process all the necessary functions associated with the electrical control of the extinguishing system and indicate signals for each flooding zone, within 3 secs of the input being received. The compulsory functions to be performed by the device shall include receiving inputs from both the fire detection system and a manual station connected directly to the device. On receipts of input signals, a signal to the release mechanism and to a distinctive continuous alarm sounder, which shall only be silenced by an appropriate access level and after confirmation of a discharge occurring, shall occur within 1 further sec unless a delay is incorporated within the programme. The activation of an emergency hold button, will be displayed on the device, both audibly and visually, and if occurring during the pre-discharge warning time will affect a change to the signal from the alarm devices in the protected area. Faults affecting the emergency hold device shall be recognised and indicated within 2secs and prevent the transmission of the extinguishing signal. Any delay time shall be adjustable between 0 and 60 sec.

The device shall be capable of displaying all conditions including device activated, fault and extinguishing system gas released. The released condition can be established upon receipt of a signal indicating a flow of the gas, (both audibly and visually), or upon the triggering of the extinguishing ignal output.

The monitoring of components such as a loss of gas will in the event of an abnormal condition indicate a fault, clearly displaying the nature of the condition and within 100s of its occurrence.

If a signal is sent to an external signalling unit, separate indication will be provided to that affect.

National guidelines can require other/different functionality, e.g. a separate indicator per flooding zone or a maximum number of monitored components per indicator.

Where an alphanumeric display is used to provide the required information, additional led's for the "Activated", "Released", "Fault", "Disabled" and "Blocked" conditions shall be provided.

The display should be capable of indicating all released flooding zones simultaneously. If it has insufficient numbers of fields the zones shall be

fixed firefighting systems - components for gas extinguishing systems

indicated by separate light emitting indicators.
A field shall consist at least of 16 characters, where it cross refers to other information or 40 characters, where the display provides a full description.

Faults signals shall be displayed for any open, short circuit or earth fault associated with all input and output devices, including monitoring circuits, disablement devices, signal transmission equipment and power supplies, both AC and DC; or if there is a fault affecting the operating program in any software controlled device. In which case not more than one flooding zone shall be affected except where a room and its void are subdivided into two zones.

Optional functions which may be performed by the device can include, delaying the signal to the release mechanism whilst providing a distinct intermittent pre-discharge warning, which shall not be interrupted, shortened or reset by a signal from the emergency hold button. To provide indication of a flow of agent together with the monitoring and control of valves and other associated components. If an emergency hold button is fitted it shall signal its status to the device together with any other mechanical parts capable of disabling the extinguishing system. The device shall receive and display any changeover from a manual to an automatic status.

If a controlled discharge of extinguishing agent is required this will be performed by the device as will the initiating of any secondary discharges. A secondary discharge will result from a second manual input, after the initial discharge and whilst the sounders in the area are still operating.

Signals to pilot cylinders, spare cylinders, optical devices, doors, ventilation plant, required as part of the cause and effect will be performed by the device.
If the information is transmitted to an external centre this shall be indicated

fixed firefighting systems - components for gas extinguishing systems

by a separate light emitting indicator and/or by an alphanumeric display. If a device is intended to control the flooding time, it shall be adjustable from a minimum time specified by the manufacturer up to at least 300 s.

In some European countries there are regulations stipulating that the activated condition can only be established after the receipt of two input signals, from independent circuits, one from the fire detection and alarm system and a further signal from the device. The first input must be both audibly and visually indicated and outputs such as plant shutdown may be triggered. If the same indicator is used for both inputs, the first input shall be indicated with a flashing light, changing to a steady light when the second input is received.

The processing of the input signal shall have the highest priority unless a signal from an emergency hold or abort button is present; a fault exists within its circuit or if the gas discharge is disabled.

If the processing of the input signal has started, the disablement of any gas zone is prohibited.

Following a reset command the activated, released and fault conditions will be reset and the display will provide indication of the current status, including any not normal conditions, within 20 s. Provision shall be made to inhibit the reset , either for a period up to 30 seconds or until an end of discharge signal is received. Disablements shall not be removed by the reset function.

Annexes to EN12094-1
Annex A – Summary of Indications
Annex B – Software controlled device
Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction products directive, (now regulation).

fixed firefighting systems - components for gas extinguishing systems

Part 3: Requirements and test methods for manual triggering and stop devices

Scope

This standard specifies the requirements and test methods for manual triggering and stop devices of CO2-, Inert Gas- or Halocarbon Gas fire extinguishing systems.

Requirements

Electrical triggering devices shall comply , generally, with the requirements of EN 54-11 type B with clear indication of the function marked on the front face with "MANUAL RELEASE - Gas extinguishing system" (or in the national language(s) acceptable in the country of use)). The colour of the component shall be yellow. A suitable yellow colour is specified in ISO 3864.

Electrical stop devices shall comply, generally, with EN 54-11 with clear indication of the function marked on the front face with "EMERGENCY STOP

- Gas extinguishing system", (or in the national language(s) acceptable in the country of use2)). The colour of the component shall be blue. A suitable blue colour is specified in ISO 3864. Triggering and stop devices, which do not follow the design requirements of EN 54-11, shall have the same electrical function, performance and marking as specified above.

The pressurized parts of components, except seals, shall be made of metal with the working pressure specified by the manufacturer. The device will be marked as suitable for wall and/or machine mounting.

fixed firefighting systems - components for gas extinguishing systems

For triggering devices the tests shall be in accordance with EN 54-11 Non-electrical triggering devices - Test samples and order of tests

Test c	Subclause
Compliance	5.15
Pressure	5.16
Strength	5.17
Function	5.18
Temperature	5.2.7
Operational reliability	5.2.8
Corrosion	5.2.9
Stress corrosion	5.2.10
Vibration	5.2.11

fixed firefighting systems - components for gas extinguishing systems

Marking

Each component shall be marked in a permanent and legible manner with the name or logo of the manufacturer/supplier, the model (type / environment category as defined in EN 54-11, the installation detail, relevant data by which, at least, the date or batch and place of manufacture and the version number(s) of any software can be ascertained together with the working pressure for manual triggering devices and associated pipework.

Where the CE marking give the same information as above, the requirements of this clause 6 have been met.

Annex ZA - deals with the clauses of the standard in respect of their compliance with the mandate of the EU Construction products directive, (now regulation).

Consultant's Guide for Fire Detection & Alarm Systems for Buildings

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